American Machinist

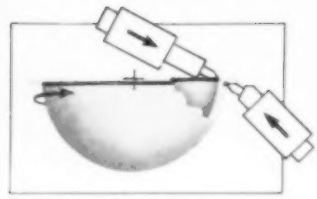
MARCH 24, 1958 75¢

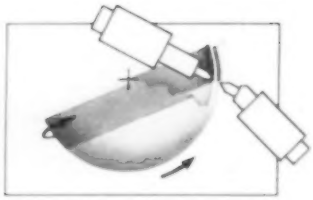
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

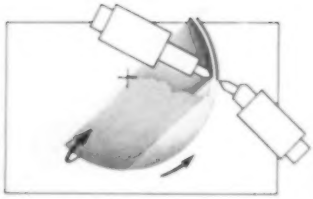
CHEMICAL MILLING: where and how

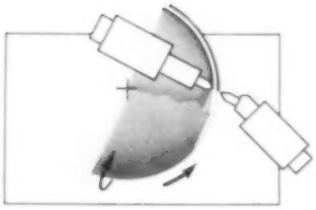
page 122

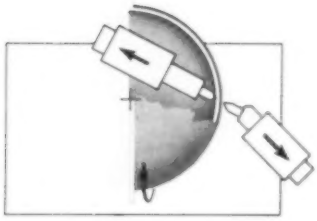
• Roll flowing the nose cone for Explorer satellite—page 106











ALUMINUM HEMISPHERES

SPHERICALLY BORIZED

on I.D. and O.D. Simultaneously

Putting a precision finish on aluminum hemispheres is the job done by the Heald Model "S" Bore-Matic shown above.

These large hemispheres require stock removal from both the I.D. and O.D., maintaining desired hemispherical shape and critical wall thickness.

The work is rim-clamped in a rotating fixture which is arranged to pivot on a vertical axis at the center of curvature. Stationary opposing tooling, mounted on two hydraulically operated slides, bores and turns the I.D. and O.D. *simultaneously*, as shown by the simplified schematic drawings at the left. Size tolerance is held to ± .0005 on I.D. and O.D. for maintaining critical uniform wall thickness. A dial indicator permits checking finish size before removing work from the machine.

This is an interesting example of the ability of a Heald Bore-Matic to meet unusual precision-finishing requirements with important savings in time, effort and expense—another reason why it pays to come to Heald.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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VOLUME 102, NO. 6

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Now, size control to 5 millionths . . . A centerless grinder at Torrington has been converted with a linear-actuator motor to provide micro-inch control. **120**

Chemical milling: where and how . . . Two views give a practical summary of this new process. **122**

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2. How to do chemical milling . . . Success depends on careful attention to these details. *By Ken Clark, Convair-San Diego.* **125**

REFERENCE BOOK SHEETS

Fusion welding of titanium, I, II, III . . . For commercial applications, fusion welding becomes more important. Here is a thorough summary of the subject. **131**

American Machinist chips

Chipless Process... When the roll flowing process was first developed, and revealed in a cover story in *American Machinist* (Mar 29 '54, p108), it caused quite a stir of activity. Another stir came the next year when a heavier machine was developed to do the same thing (*AM*—May 9 '55, p190). Since then the process has made slow, steady progress and has been a factor in the growing popularity of the term "chipless machining."

Guided Editors... Early this month the wraps came off the production of the stainless steel cone for the Explorer satellite (*AM*—Mar 10 '58, p97). This focused new attention on the roll flowing process. Moving with something approaching the speed of guided missiles our editors went to work on a progress report on the process which you will find starting on page 106. We changed the cover of this issue to show you in color the Explorer operation and Chuck Emerson, Bill Stocker, and George De Groat visited plants using roll flowing from Long Island to California. The result was thousands of miles of travel, hours of personal conversation with men close to the process, and a story that summarizes current practice and shows, for the first time, an important new development in roll flowing. It is all a good example of the kind of thorough fast-breaking reporting on metalworking developments that is routine for our staff.

Chem Milling... Another hot process in the chipless machining area is chemical milling. You'll find detailed answers to the two principal questions in this issue. First, where can you use chemical milling? Second, how do you do it? You'll find a compact answer to the first question and the most detailed answer we've yet seen to the second. They start on page 122.

Coming... *AM* for April 7 unveils more changes in the gradual reorganization of our content for fast, easy reading that makes possible the kind of treatment you find in the roll flowing article. Special articles include some of the most amazing drillpress tooling ever seen and a story from Puerto Rico that will give you some training ideas. Better plan now for the training problems you'll have when the upturn comes.

Cover...

Nose cone for the Explorer satellite is formed on a Floturn machine at Lodge and Shipley. See details at left.

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Helixform*—a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

The Helixform Cutting Method used on this machine offers these advantages:

Conjugate tooth surfaces, minimized gear development, complete control of tooth bearing, and greater adjustability in final assembly.

We will be glad to send a bulletin giving further details on request. Ask for literature on the No. 112 Hypoid Helixform Gear Finisher and the companion No. 112 Hypoid Gear Rougher. Write for it today.

*Trade-Mark

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CO-A

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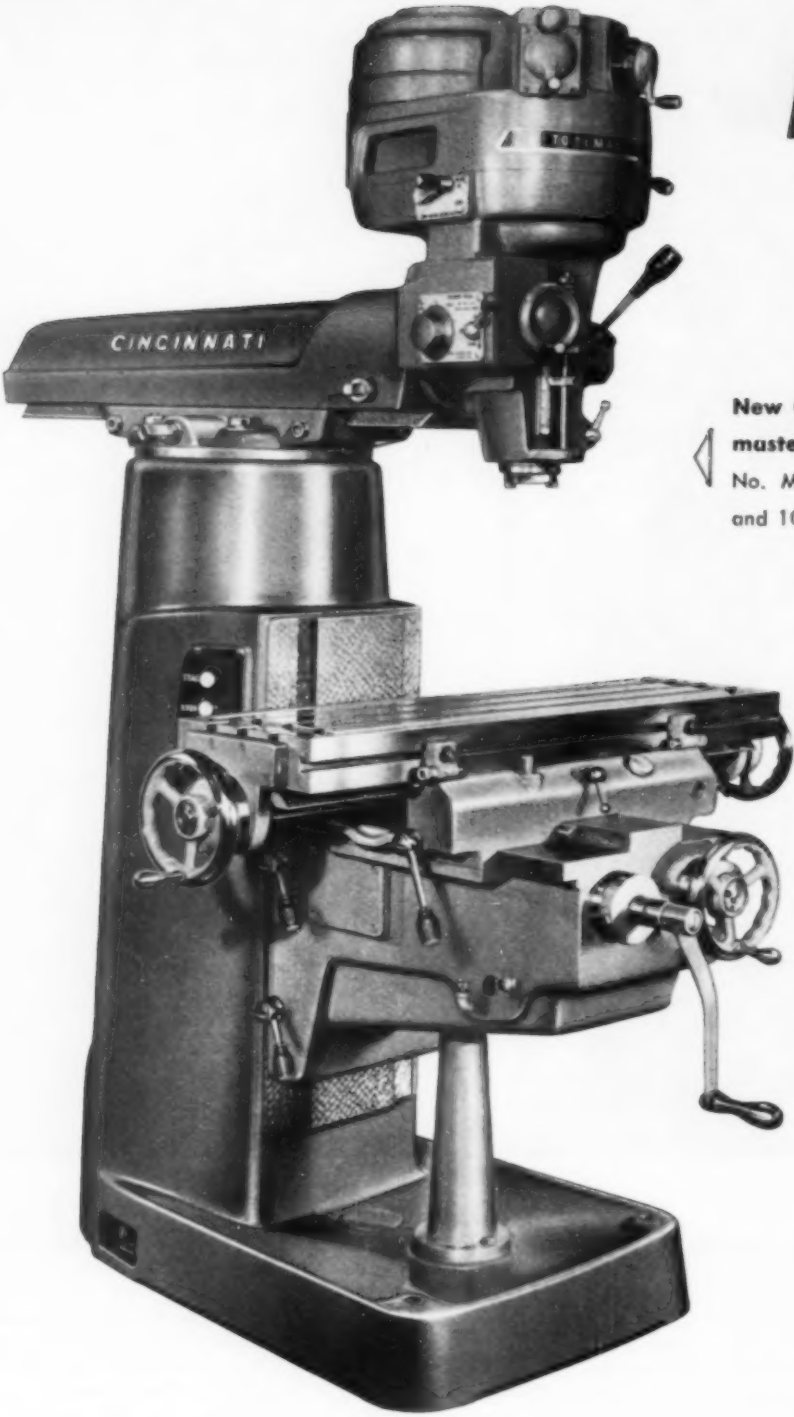

New CINCINNATI No. 1D Toolmaster Milling Machine. Catalog No. M-2017. Other styles: 1A, 1B and 1C; catalog No. M-1870-4.

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MILLING MACHINES • BROACHING MACHINES • CUTTER
METAL FORMING MACHINES • HARDENING MACHINES •

1-D..newest member of the

CINCINNATI TOOLMASTER Family

Hundreds of CINCINNATI Toolmaster Milling Machines — the familiar 1A, 1B and 1C styles — are giving an excellent account of themselves in shops throughout the country. And now the new 1D Toolmaster extends the versatility of this fine family of machine tools still further. Exclusive 1D features and advantages include:

Infinitely variable spindle speeds. 100-3800 rpm

Instant selection of spindle speeds . . . through a control lever on front of the spindle head

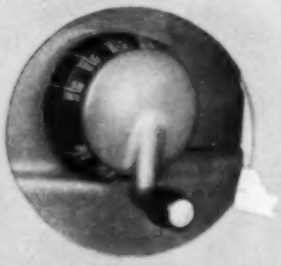
1½ hp spindle drive . . . and it's all usable

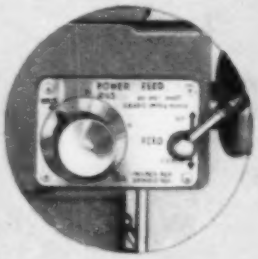
No. 40 standard taper hole in spindle . . . and positive key drive for arbors and collets

Power quill feed (extra) . . . up and down; three feed rates; power trip-out

These and other features and advantages give 1D Toolmasters the highest performance rating for reducing the cost of vertical and angular milling operations, and, with additional equipment, boring and shaping operations as well. Now's the time to replace your worn out ¾ to 1½ hp milling machines with new CINCINNATI Toolmasters. Complete information in attractive catalogs. May we send copies to you?

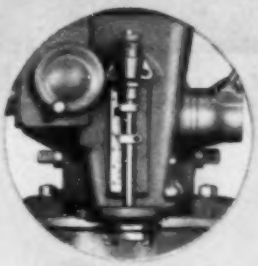
Spindle speeds are changed instantly. Merely select the high or low range and then rotate this control lever to the speed desired. Speeds are dial indicated.

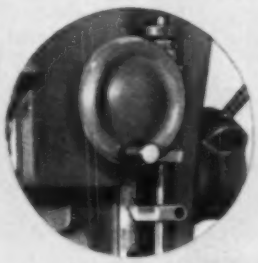




For boring and drilling operations, you'll want power feed to quill, at slight extra cost. Three feed rates; knob selected; up and down; .0015", .003" and .006" per rev.

Precision quill depth gage accurately positions the quill where you want it. The device is located where it's most convenient for the operator . . . on front of the spindle head.





Quill feed handwheel, mounted on front of the spindle head, advances the quill in fine feed progression. A lever on the right-hand side quickly advances or retracts the quill.

• AND TOOL GRINDERS • SPECIAL MACHINE TOOLS
• CUTTING FLUIDS • GRINDING WHEELS

THE CINCINNATI MILLING MACHINE CO.
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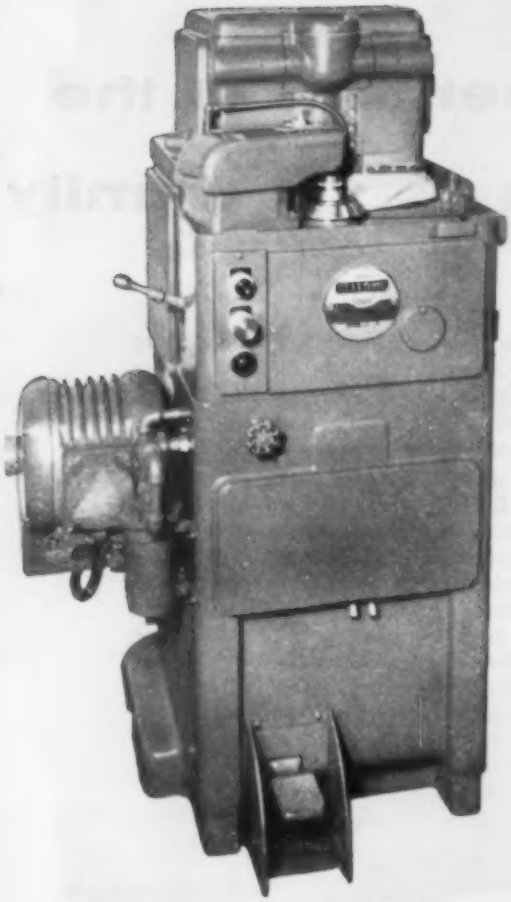
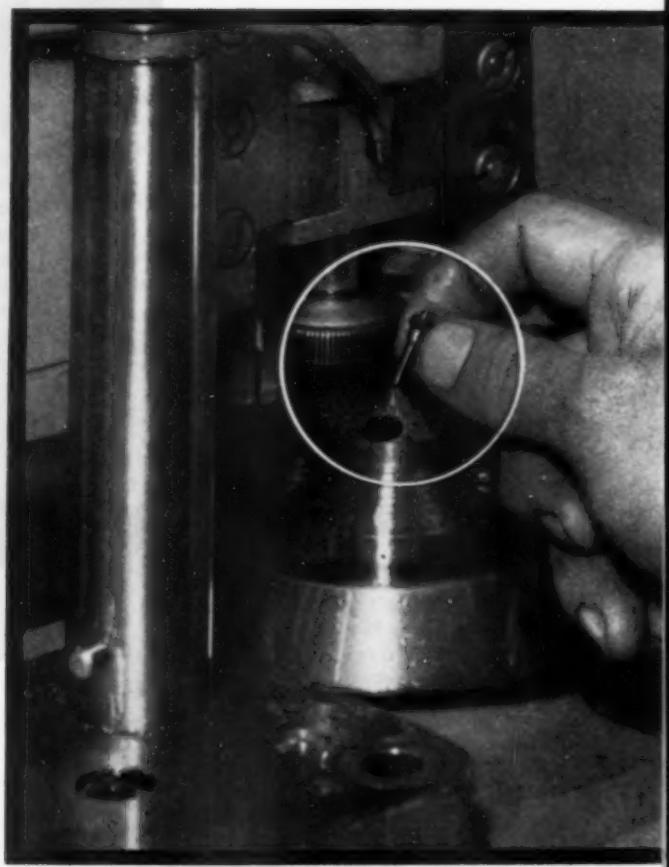
Lowers Pinion

WITH FELLOWS



FELLOWS 3' FINE-PITCH
GEAR SHAPER



Speed and accuracy of the new 3' machine increased production of this pinion from 55 per hour to 120.

THE
PRECISION
LINE

Production Cost from 16.9¢ to 6¢ each!

FINE-PITCH PRODUCTION EQUIPMENT

Fellows No. 4 Fine-Pitch Red Liner Inspection Instrument gives proof of accuracy.

Here's an example that shows how Fellows machines pay off in lowered gear production costs. This small pinion is manufactured for a major instrument maker on a Fellows 3" Fine-Pitch Gear Shaper.

Production is 120 pinions per hour, more than twice the production of previous machines. In addition, pieces are automatically deburred, eliminating an operation. *Result:* the cost per pinion is 10.9 cents lower than before!

Fellows 3" Fine-Pitch Gear Shaper cuts within close tolerances at speeds up to 2,000 strokes per minute. The Fellows No. 4 Fine-Pitch Red Liner inspection instrument gives chart-recorded, permanent proof of the accuracy of the product.

For full information about the Fellows Precision Line of gear production equipment—from 1/16" P.D. to 120" P.D.—contact your Fellows representative. Write, wire, or phone any Fellows office.

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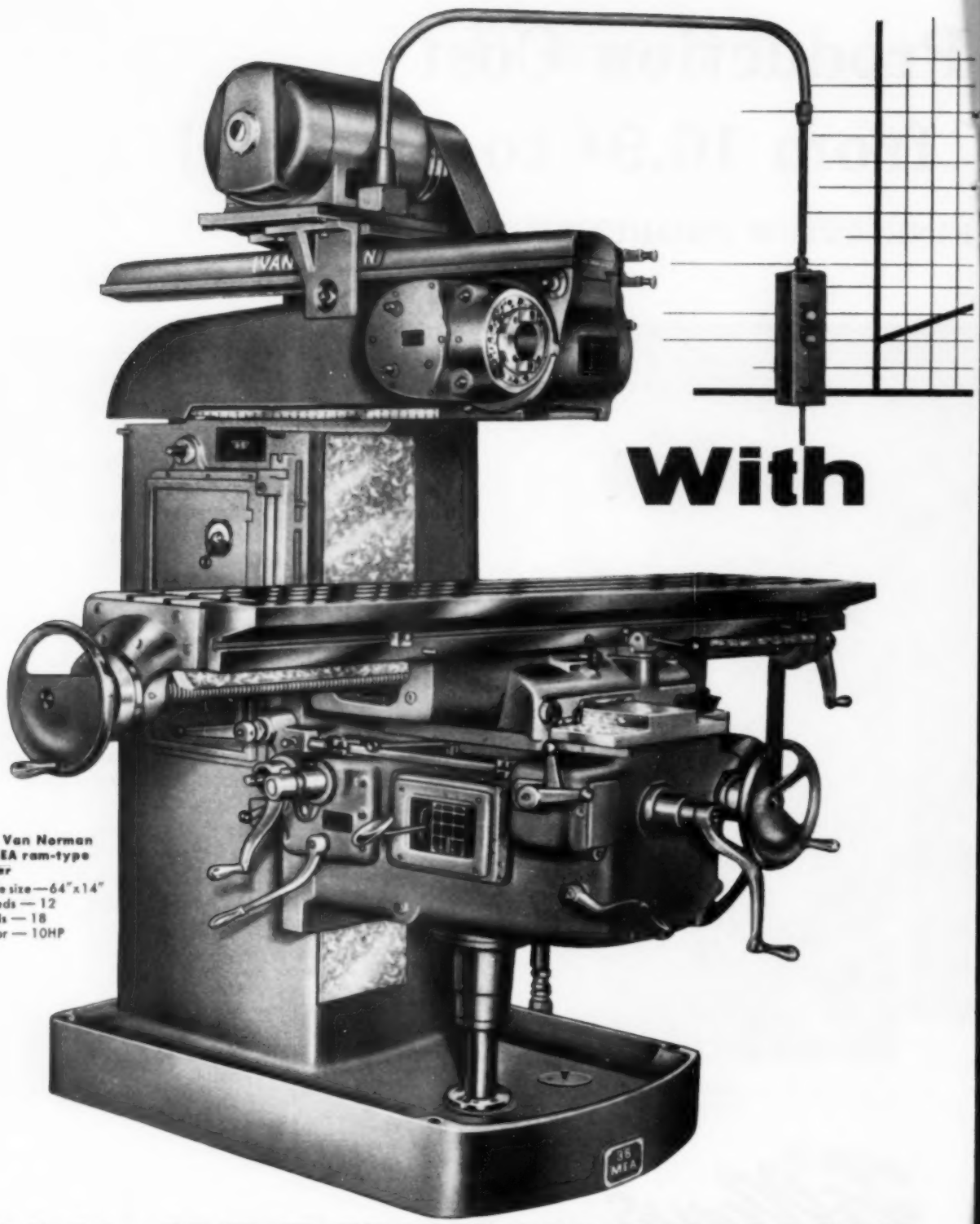
Fellows *Gear Production Equipment*



With

The Van Norman 38MEA ram-type miller

Table size—64"x14"
Speeds — 12
Feeds — 18
Motor — 10HP

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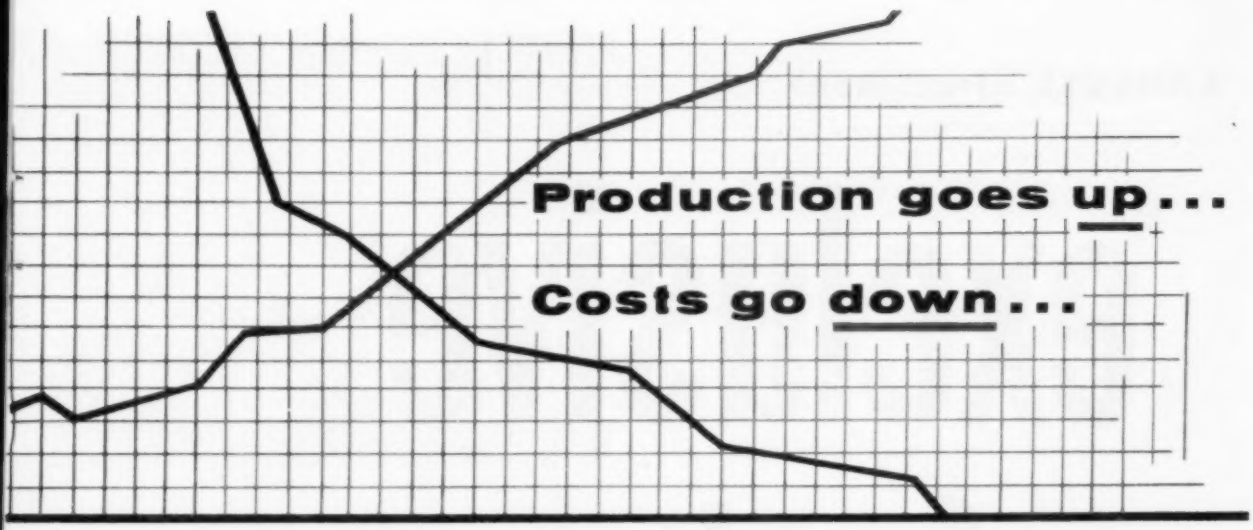
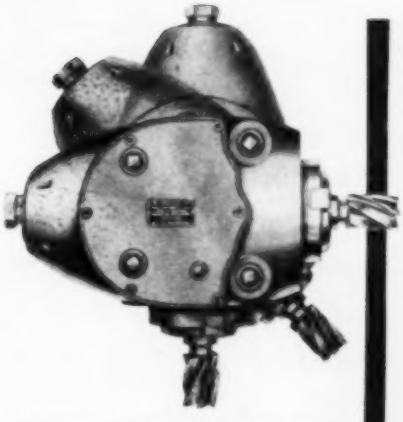
A DIVISION OF VAN NORMAN INDUSTRIES, INC.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



Van Norman Dollar-Saving Millers



The exclusive Van Norman adjustable cutterhead which can be easily set for horizontal, vertical or angular milling. Remember, with Van Norman millers, the cutterhead moves — not the work.

You get the equivalent of two conventional millers, plus attachments, when you make *one* investment in *one* Van Norman ram-type miller. That's because the exclusive Van Norman adjustable cutterhead lets you do horizontal, vertical and angular milling — all on one Van Norman machine.

You save important investment dollars and important production dollars thru reduced setup time, idle machine and operation time — plus boosting production.

Get complete details on the Van Norman 38MEA — and all Van Norman dollar-saving millers. Write, wire or phone for detailed catalog.

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Don't wait . . . for extra profit install a Van Norman machine now!
They are available in many purchase plans . . . Outright sale . . .
Purchase on conditional sales contract up to five years . . .
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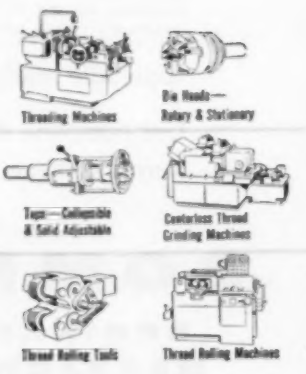
LANROLL attachment

exclusive features

The LANROLL Attachments offer certain features of design that ensure greater accuracy, flexibility and economy not generally found in Thread Rolling Tools. The LANROLL Attachment (capable of producing straight or taper threads) is primarily for application to bar automatics, but may be applied very successfully to the cross slide of a lathe with power feed. Five sizes of the Attachment thread all diameters from #5 to 1¾" (1/16" to 1¼" pipe). For additional detailed information, please request Bulletin G-96.

These THREADING TOOLS displayed at Booth 1538 ASTE Show



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LANDIS *Machine* COMPANY

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THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

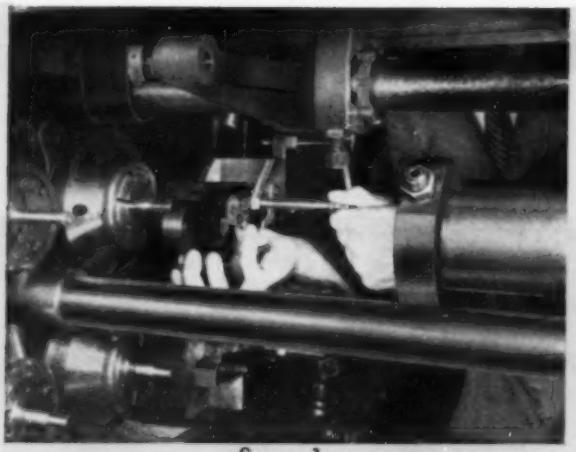


figure 1

1. Disengaging the attachment from the shank for servicing and tooling changes without disturbing the original set-up is made possible by the simplicity of design. The shank maintains attachment set-up position and remains clamped on the tool slide. Removal of the attachment from the shank simply requires that a single retaining screw be released and the shank pin withdrawn. (Figures 1 & 2).

2. Tipping avoids indexing interference on bar automatics having a limited tool slide movement. When necessary, the basic design permits the attachment to radially pivot away from the rolling area on completion of the thread (Figure 2). This also permits: an attachment of heavier construction, minimizing deflections and assuring exact sizing; larger roll diameters for greater rolling efficiency; and more rugged spindles.

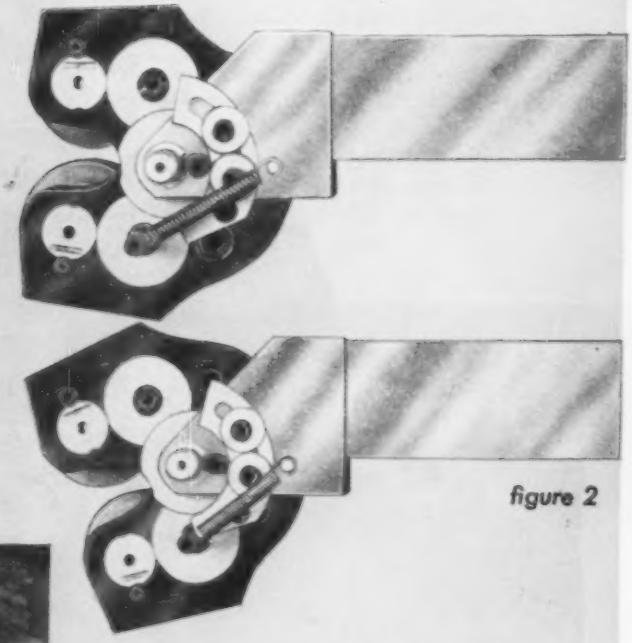
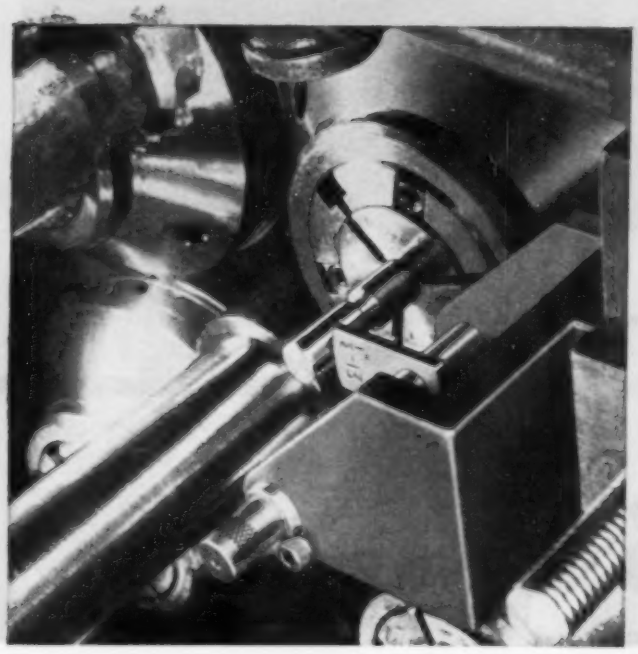


figure 2

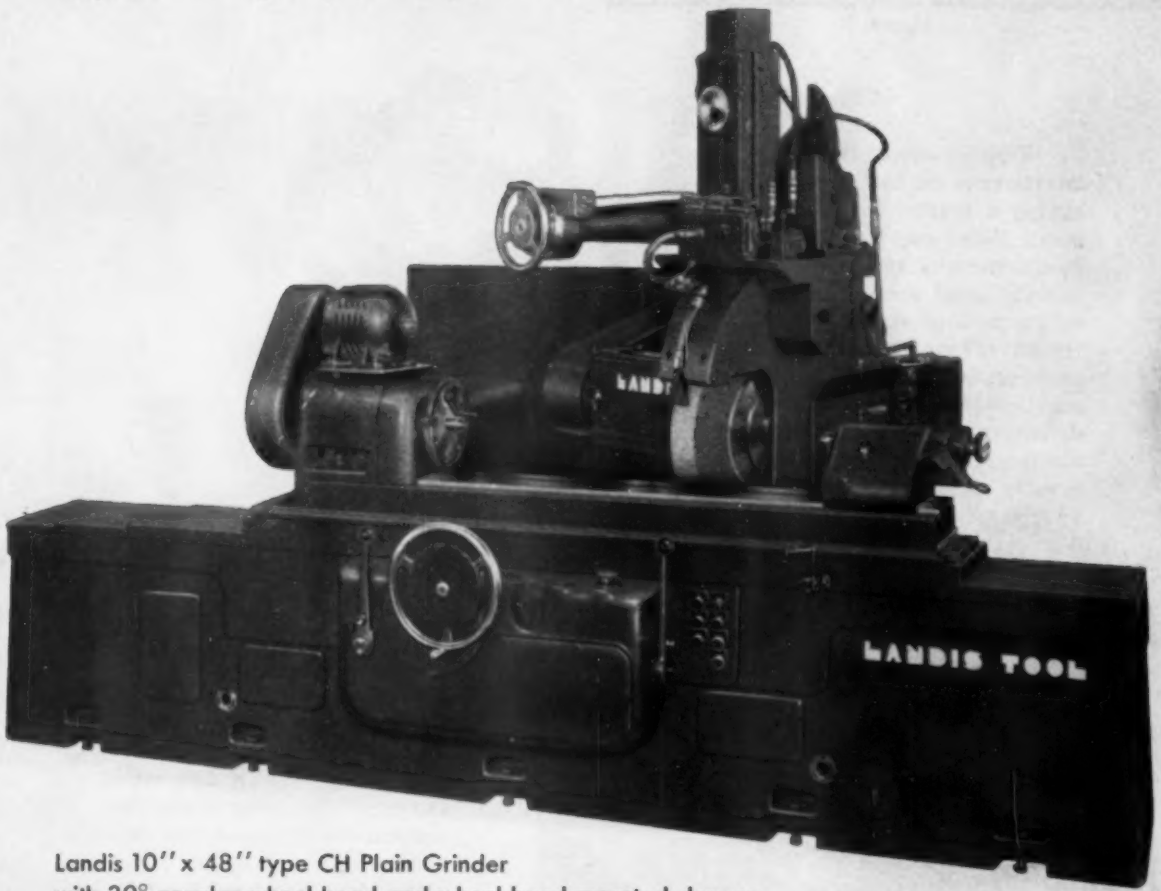


3. A Gage quickly determines the precise position where the vertical centerlines of both the rolls and workpiece coincide. After the attachment has been positioned horizontally in relation to the prepared workblank, the setting gage is slipped over the shank pin. The high point of the machine's feed cam is established, and the tool slide is advanced until the gage abutts with the O.D. of the workblank (Figure 3).

figure 3

One new Landis grinder over *three* older machines

Landis plain grinder with 30° angular wheel head grinds 3 diameters and face at one time. Replaces 3 single operation grinders.



Landis 10'' x 48'' type CH Plain Grinder
with 30° angular wheel head and wheel head mounted dresser

LANDIS
precision grinders

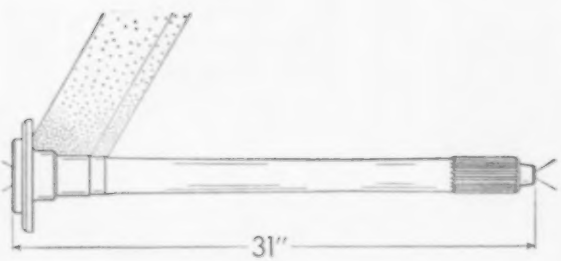
LANDIS TOOL COMPANY

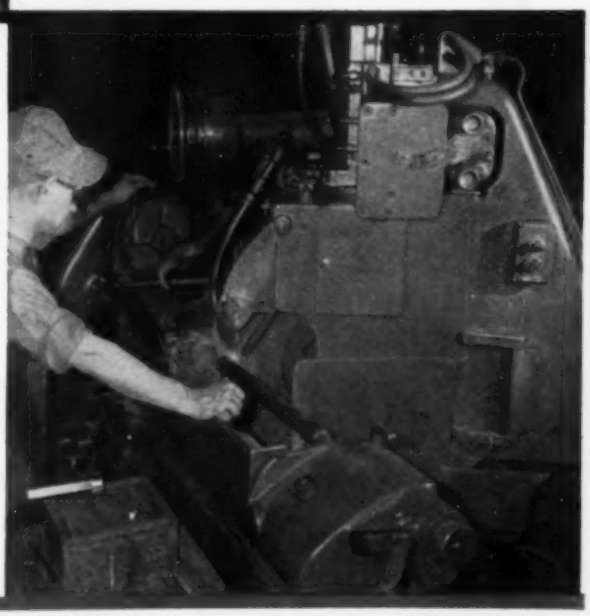
steps up production 20%

production data

Machine:	New Landis 10" x 48" type CH Plain Grinder with 30° angular wheel head
Part:	Tractor axle
Operation:	Infeed grinds 3 diameters and adjacent face in one operation
Production:	35 parts per hour
Material:	9490 "H" steel forging
Hardness:	40-46 Rockwell C
Stock removal:	.020"-.023" on diameters .008" on face
Finish:	16 RMS on diameters 32 RMS on face
Tolerance:	.0005" on diameters

Accurate wheel dressing is obtained with the hydraulically operated profile wheel dresser. The entire face of the wheel is dressed in one continuous traversing movement.

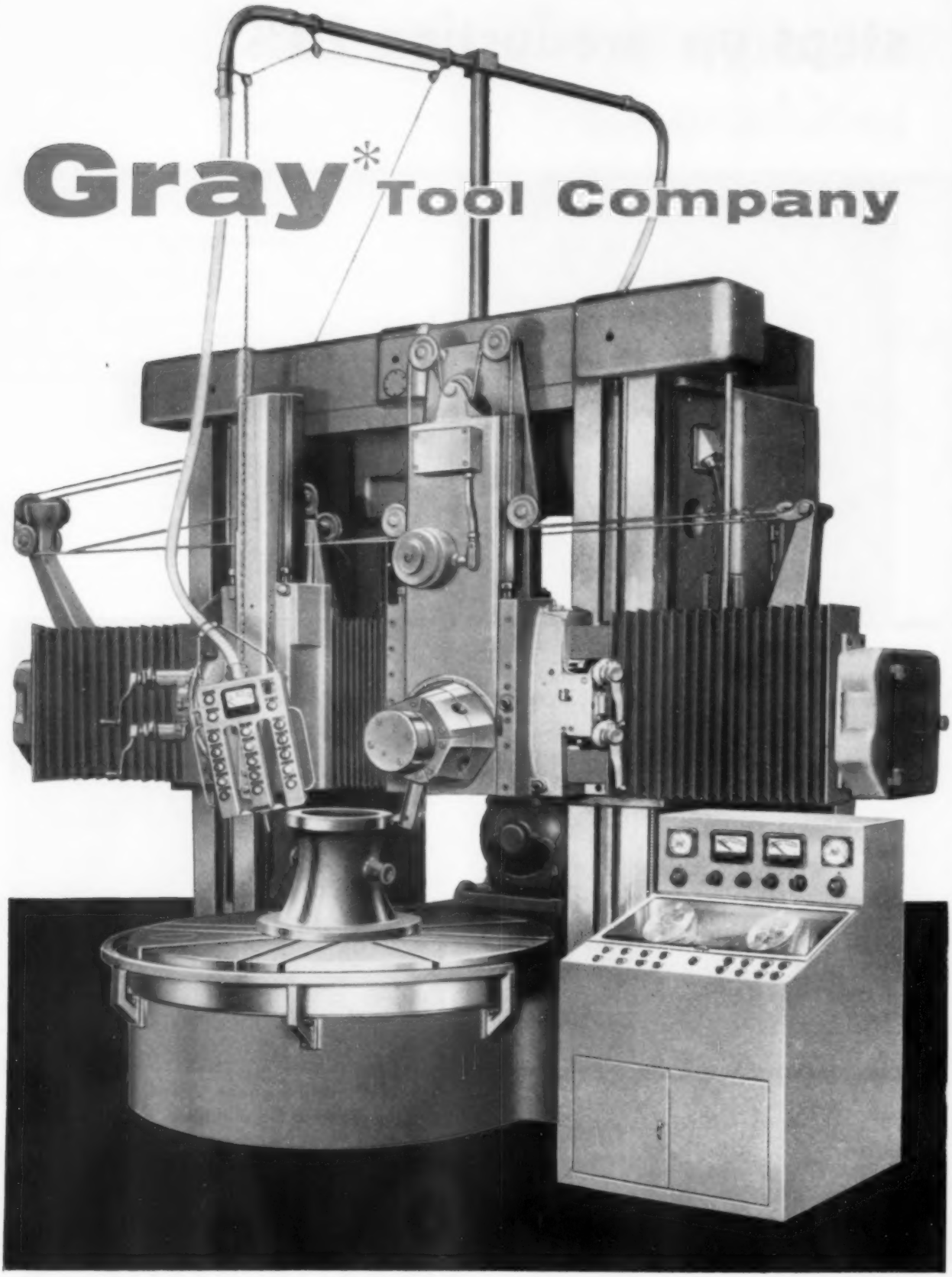




A lateral locating gauge is used to establish the correct position of the workpiece. Completely automatic feed allows the operator to dog the next workpiece during the grinding cycle.

WAYNESBORO, PENNSYLVANIA

Gray* Tool Company



buys a G&L

HYPRO 54-inch Vertical Boring and Turning Mill

World's first numerical path-controlled Vertical Boring Mill automatically reproduces parts . . . eliminates error!

Gray Tool Company, Houston, is the *first general purpose metalworking firm* to take advantage of the big cost-saving production benefits of a G&L HYPRO Vertical Boring Mill equipped with G&L's NUMERICORD numerical continuous-path control for multi-axis machine tools.

This outstanding G&L combination equips this progressive oilfield equipment manufacturer to offer both remarkably fast production and fast replacement service.

Error, scrap, template manufacture, and storage expenses are eliminated. Now Gray can reproduce identical workpieces in small or large lots . . . and can *economically* and *identically* duplicate them at any time.

The G&L Vertical Boring Mill is equipped with a 5-position turret head and a ram-type rail head. The NUMERICORD magnetic tape automatically controls all machine functions and work cycles. The machine provides 16-feed selections and constant SF/M cutting speed to table.

G&L HYPRO Vertical Boring and Turning Mills are available in 12 models . . . table diameters from 54" to 14' . . . table work load capacities to 125 tons . . . motor drives to 150 hp. For further details, including NUMERICORD control data, see your nearest G&L representative or write G&L direct.

G&L HYPRO Vertical Boring and Turning Mill

Here's the world's first Vertical Boring and Turning Mill equipped with NUMERICORD system of machine tool automation for Gray Tool Company of Houston, Texas. (Control console at right of machine). NUMERICORD system provides a "complete store of skills" . . . makes workpiece accuracy a function of engineering planning! Tolerances are easily held within working limits of the machine. On every job, elimination of non-cutting intervals is achieved. This adds up to very substantial time-savings.

Gray Tool Company of HOUSTON, TEXAS

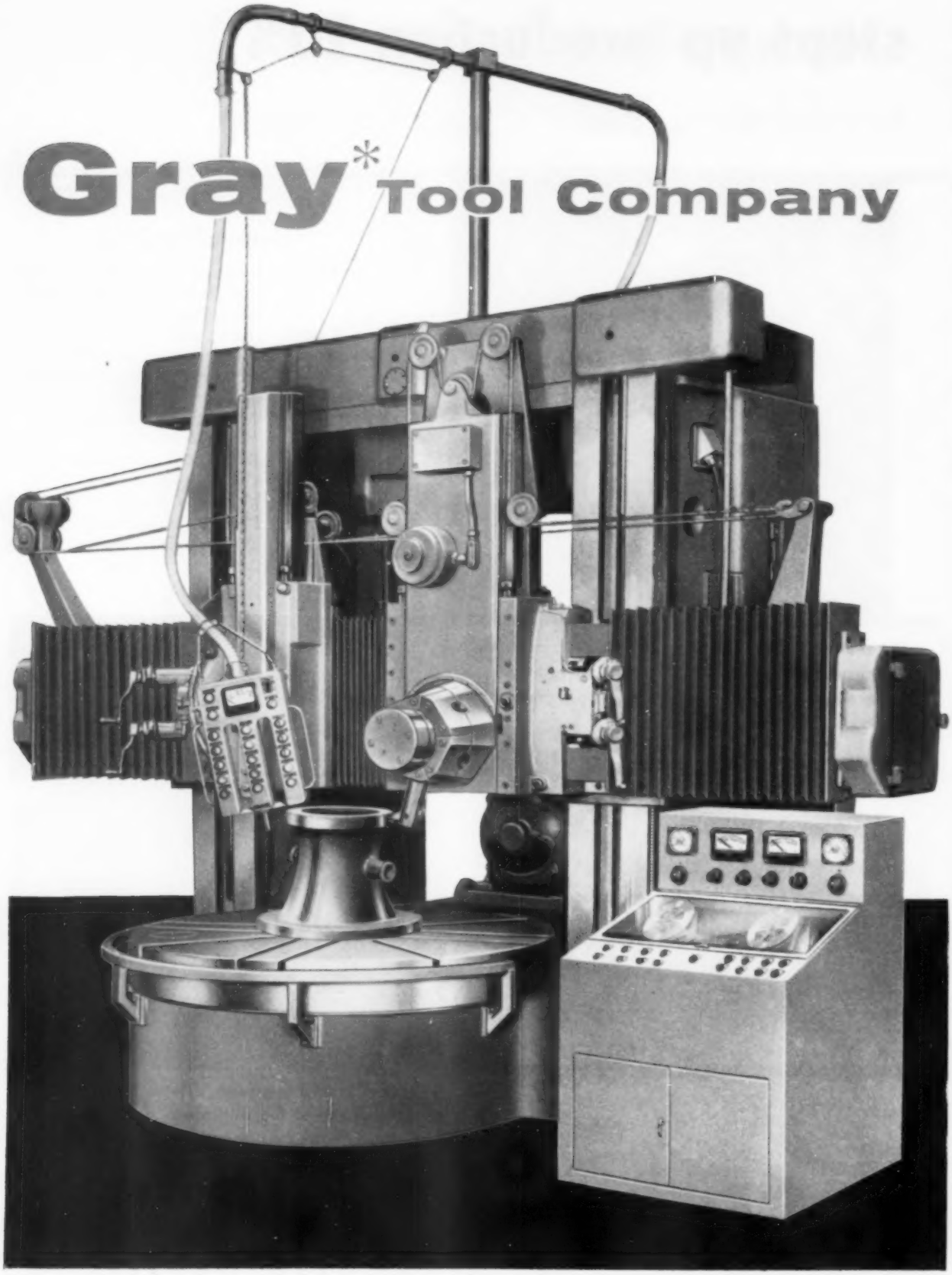
Manufacturers of specialized drilling and production equipment for the oil industry.

G&L *and* HYPRO DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN G-90

Builders of the world's finest heavy-duty Table, Floor and Planer Types Horizontal Boring, Drilling and Milling Machines; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring and Turning Mills; Spar and Skin Milling Machines, VARIAX Milling Machines and NUMERICORD-numerical continuous path tape controls.


Gray* Tool Company

buys a G&L

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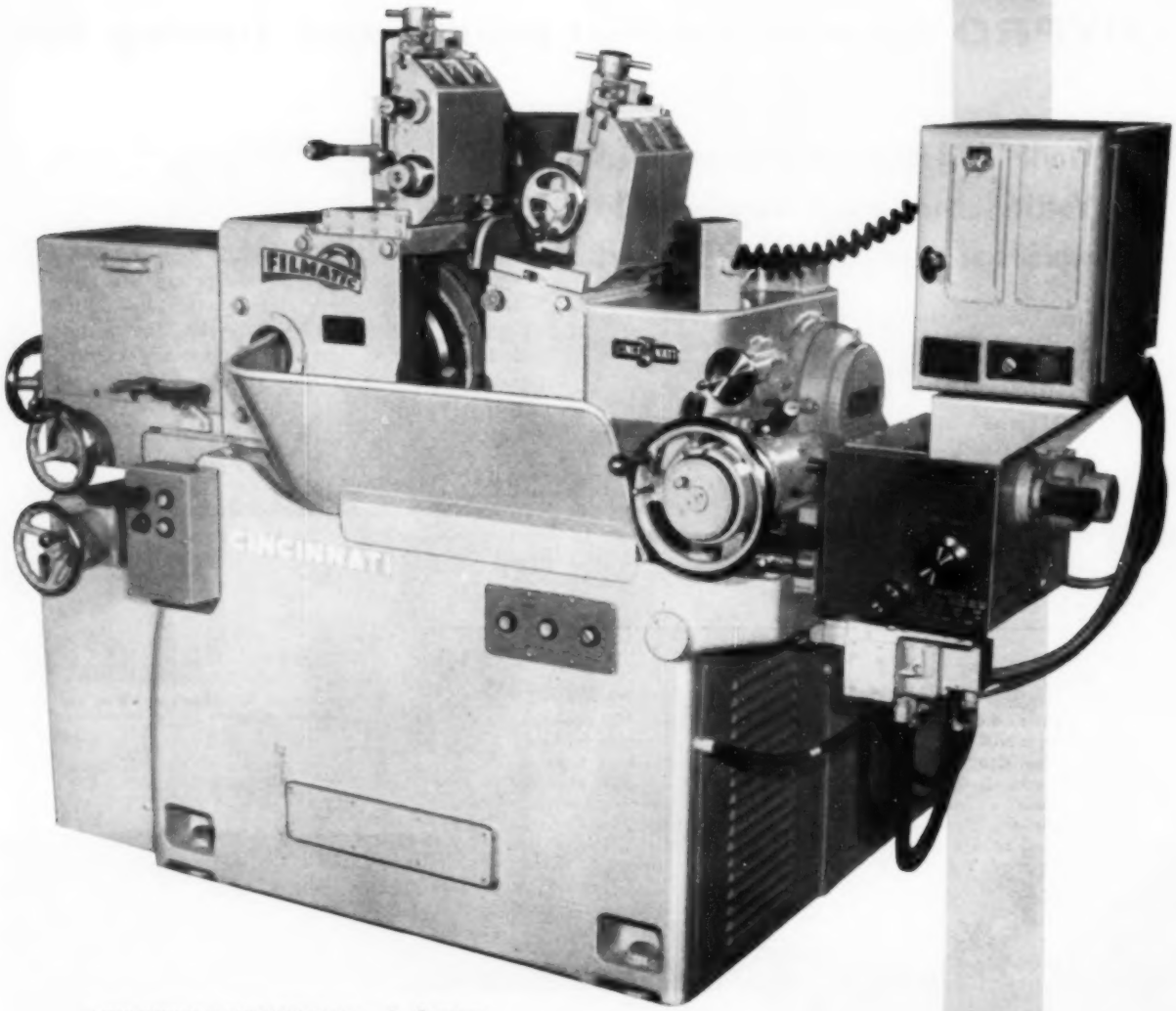
New Cincinnati Filmatic No. 1



CINCINNATI FILMATIC No. 1 Centerless Grinding Machine, with Crush Truing Attachment and Electro-Hydraulic Automatic Infeed Attachment. Catalog No. G-703.

CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING
ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

. . . Top Performer in Centerless Grinding Small Parts, including Accurate Form Work requiring *Crush Trued Wheels*

Everyone concerned with quality and costs will be delighted with the performance of new CINCINNATI FILMATIC No. 1 Centerless Grinding Machines. They are built for precision infeed and thrufeed work, and can be equipped with a variety of production attachments, **including crush truing.** Highlights of design and how they contribute to top performance include:

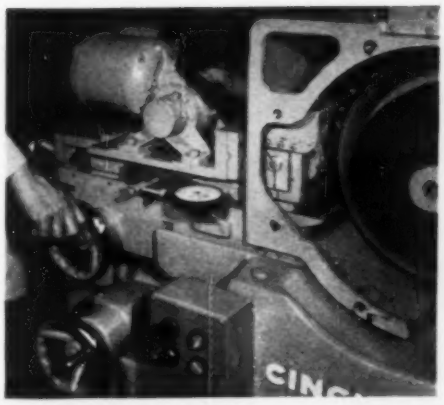
Exclusive FILMATIC grinding wheel spindle bearings . . . over 99% of these bearings on all CINCINNATI Grinding Machines have never required service

Swivel mounted regulating wheel unit . . . reduces setup time

Automatic and oil shot lubrication

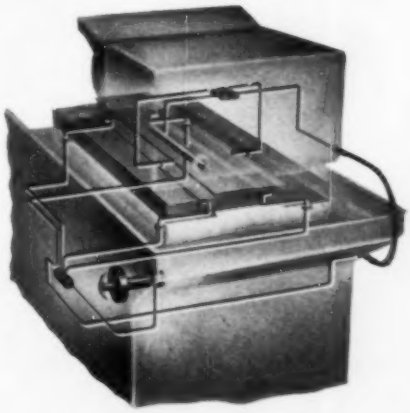
Engineered electrical controls . . . enclosed and protected from damage and tampering

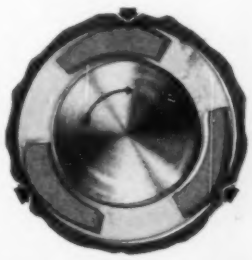
In addition, Cincinnati has a selection of 19 attachments, such as graduated axial spindle adjustment, Electro-Hydraulic automatic infeed, grinding wheel spindle reciprocation, crush truing, and others. ¶ Your centerless grinding equipment for work within 1½" diameter range can now be profitably replaced with new CINCINNATI No. 1's. Our Engineering Service Specialists, the world's most experienced in tooling up centerless grinders, are ready to help. Get a good start by asking for catalog No. G-703.



Crush truing unit, with cover removed. Crushing rolls are cartridge mounted for setup convenience. Motor mounted on the bracket drives the rolls for regrinding them, while an auxiliary motor supplies the slow speed required for effective wheel crushing. Diamond wheel truing unit is mounted on top of wheel guard.

Oil-shot lubrication retains new-machine accuracy for years.



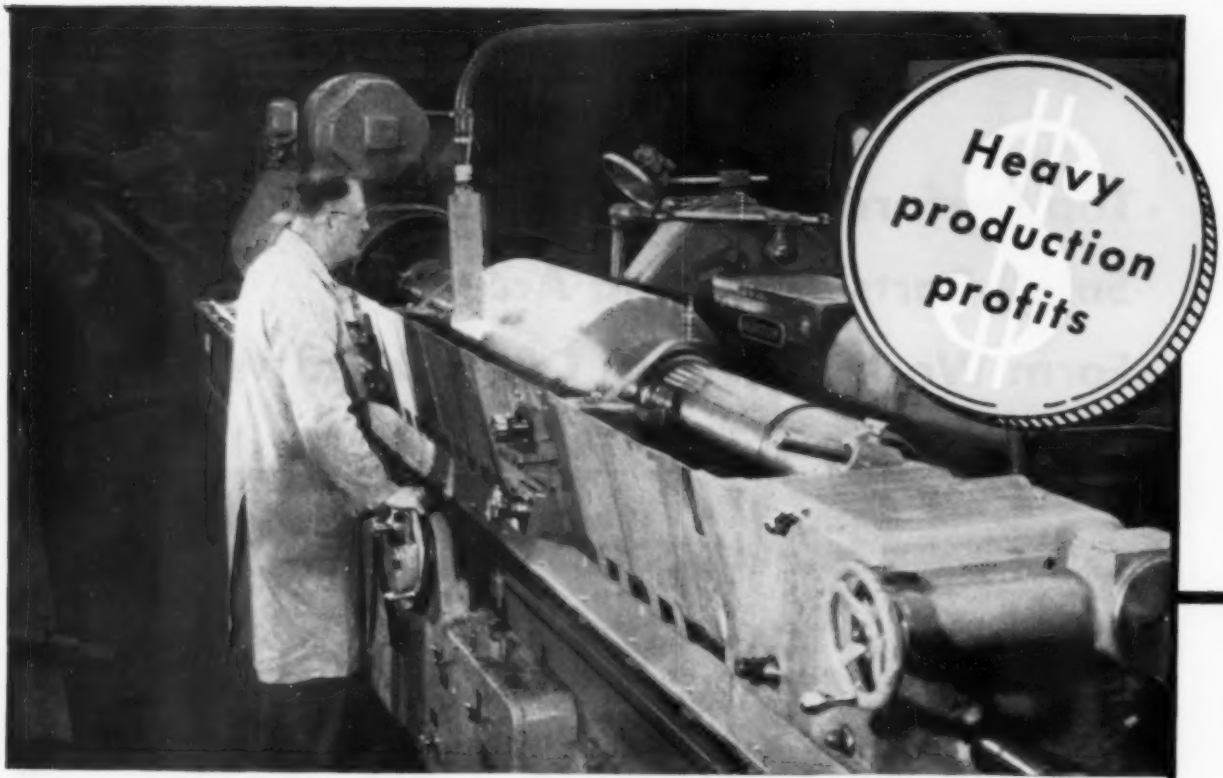


FILMATIC grinding wheel spindle bearings just never wear out or require adjustment.

CINCINNATI

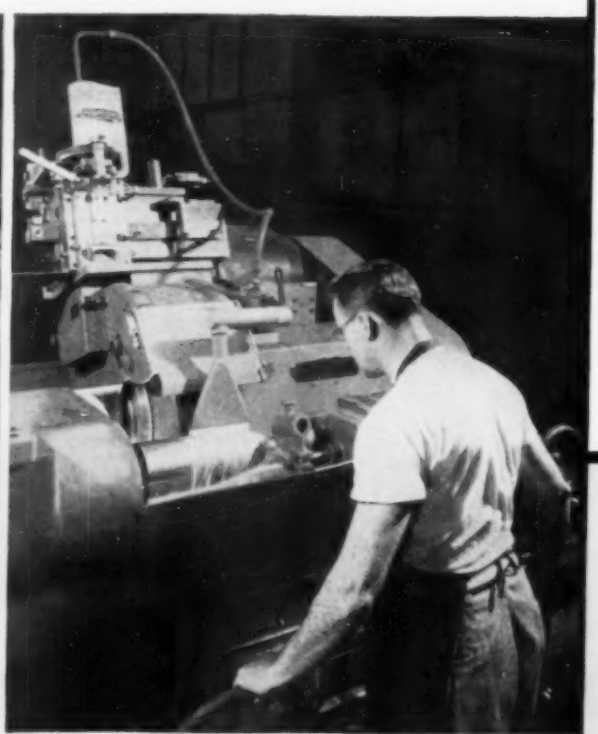
MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



C-2 AS A ROLL GRINDER for straight, convex, or concaved rolls.

C-2 PLAIN for lowest cost traverse grinding.



C-2 AS A SEMIAUTOMATIC for effortless plunge grinding.

Heavy duty cost cutter —the big Norton C-2

The Big Norton C-2 Cylindrical Grinder removes stock like a steam shovel and handles as easy as your '57 car. It gives you the Norton "Touch of Gold" on massive grinding jobs — large motor and turbine shafts, lathe and drilling machine spindles, radial mill columns, boring bars and the like.

With smooth, abundant power and a rigidly-ribbed base, the C-2 handles work lengths to 240" and diameters to 24".

It cuts production costs because it sets up quickly and keeps downtime to a minimum.

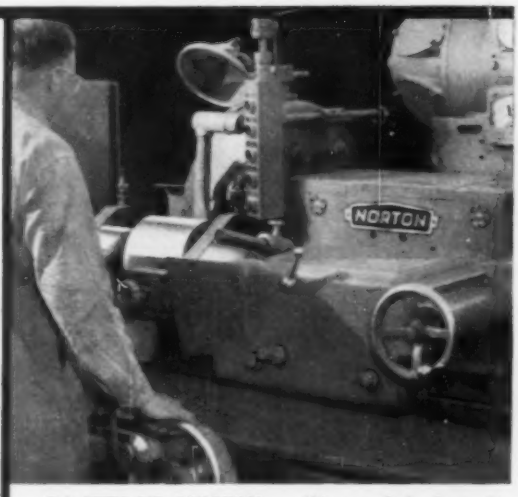
You can have the C-2 in three arrangements — *plain, semi-automatic, or roll.*

It is built in three swings of 14", 18" and 24". The 14", in lengths from 36" to 168". The 18" and 24", in lengths from 48" to 240".

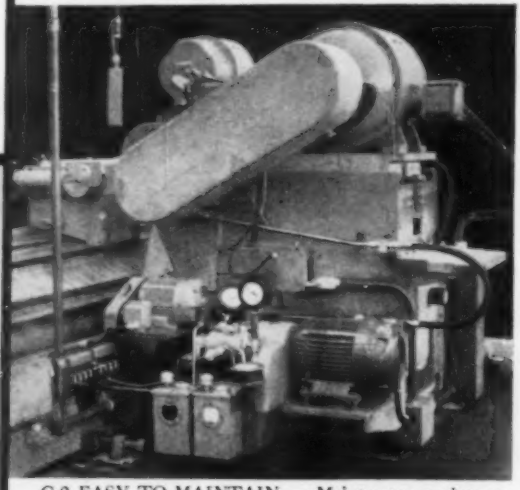
If you use the C-2 semiautomatically, all your operator does is move a single lever for grinding repetitively to exact size and finish.

If you use the C-2 as a roll grinder, the Norton tilting wheel head crowning mechanism comes with it. This mechanism moves the grinding wheel contact point away from or toward the axis of the roll as the roll is moved past the wheel face and is cam and gear controlled to produce any crown desired.

Remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. For further facts, see your Norton Representative, or write to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



C-2 SETS UP QUICKLY — All controls in front. No reaching by operator. Click count wheel feed index eliminates need for visual attention.



C-2 EASY TO MAINTAIN — Maintenance points on outside of base.

To Economize, Modernize with NEW

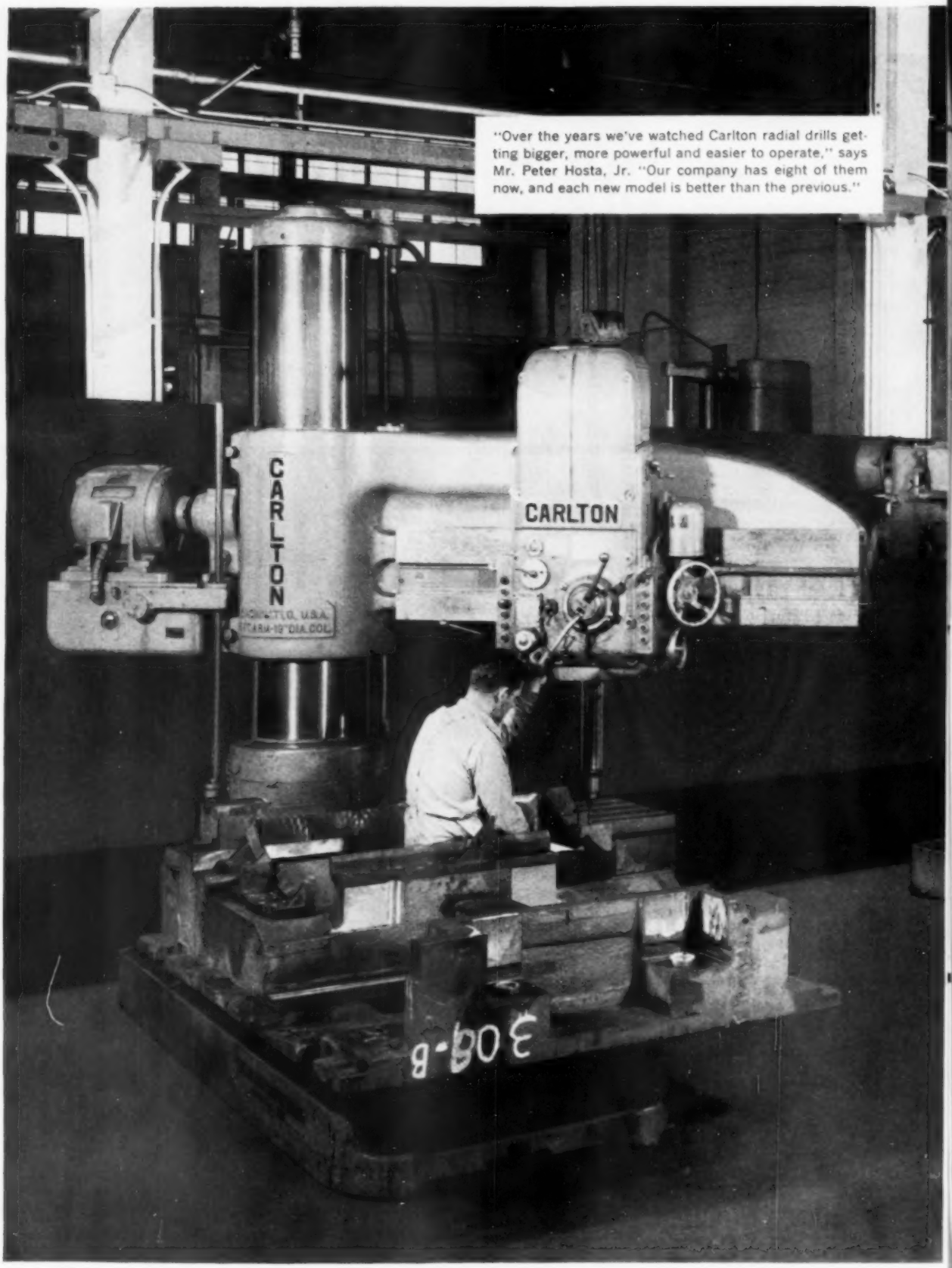
NORTON

GRINDERS and LAPPERS

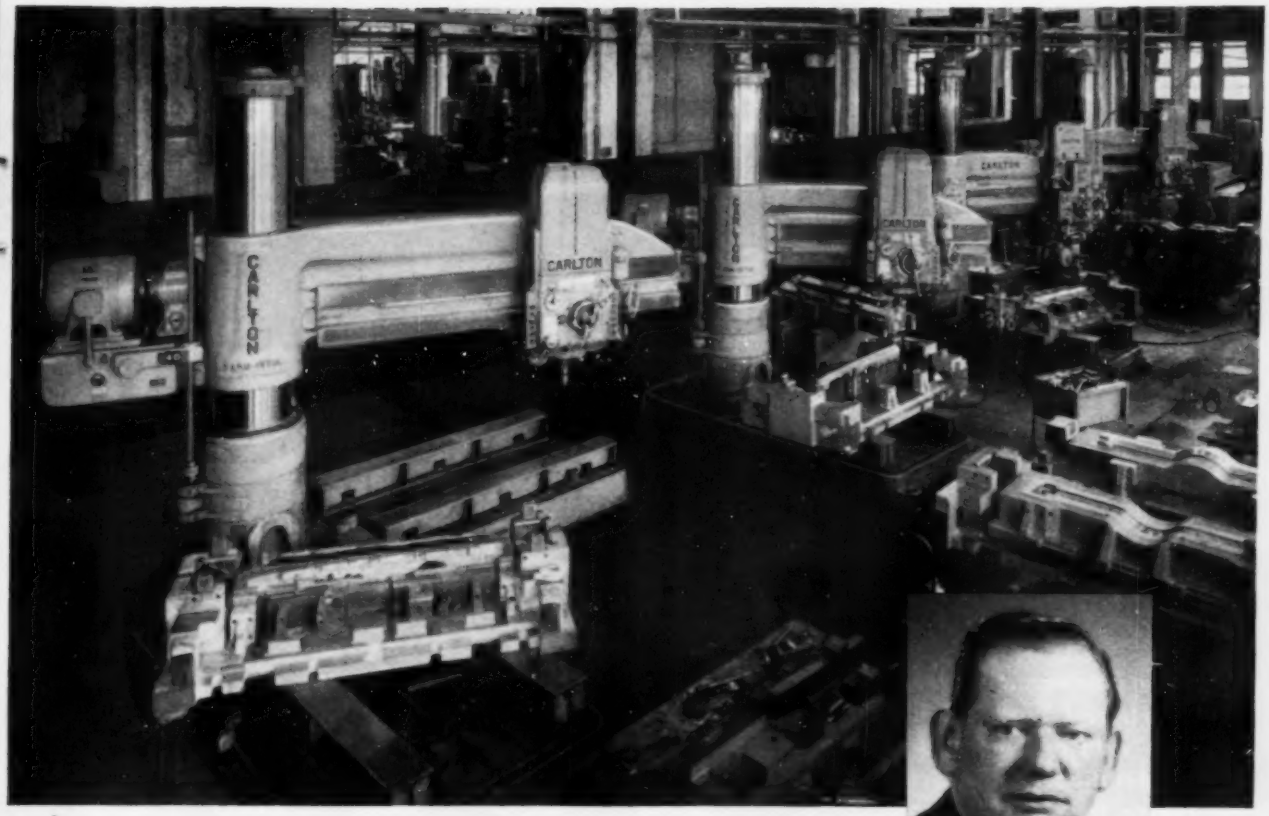
Making better products . . . to make your products better

District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cut Tapes



"Over the years we've watched Carlton radial drills getting bigger, more powerful and easier to operate," says Mr. Peter Hosta, Jr. "Our company has eight of them now, and each new model is better than the previous."



Power? Capacity?

Carltons have it! And they're real money-makers, too

That's what Peter Hosta, Jr. says. And he *knows* his equipment . . . because his company, Buffalo Tool & Die Mfg. Co., Buffalo, now owns and operates eight Carlton radial drills.

"We machine a lot of metal for the automotive and aircraft industries. Believe me, our work has to be good to please our customers. Those Carltons have the power and capacity to handle our type of work.

"Accuracy is the most important advantage. Carlton radial drills have completely solved the pesky problem of rejects.

"Here's the way we feel at Buffalo Tool & Die: Carlton concentrates on making good radial drills and nothing else. So how can they help bringing out the best ones in the business."

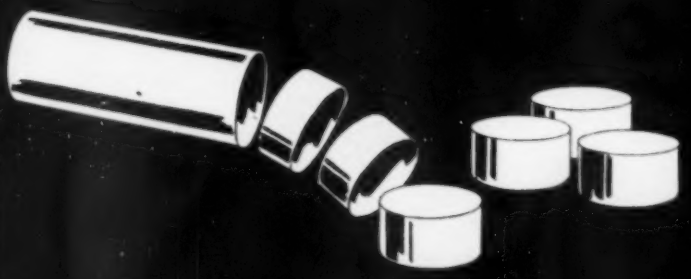
To that we at Carlton say Amen . . . and thank you, Mr. Hosta. And to metalworking management men everywhere we say this: could the Carlton power, capacity and precision performance Mr. Hosta likes so well be just as profitably applied to your drilling requirements? Why not investigate and see?

The Carlton Machine Tool Co., Cincinnati 25, Ohio

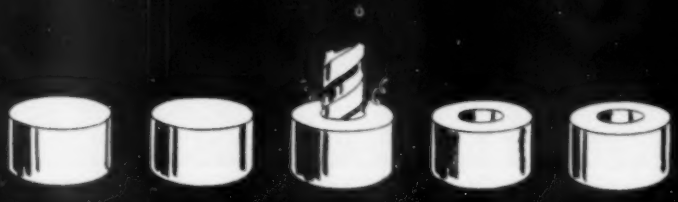
Carlton **SPECIALISTS IN RADIAL DRILLS**

For greater profits . . . SLUG the "AC" way

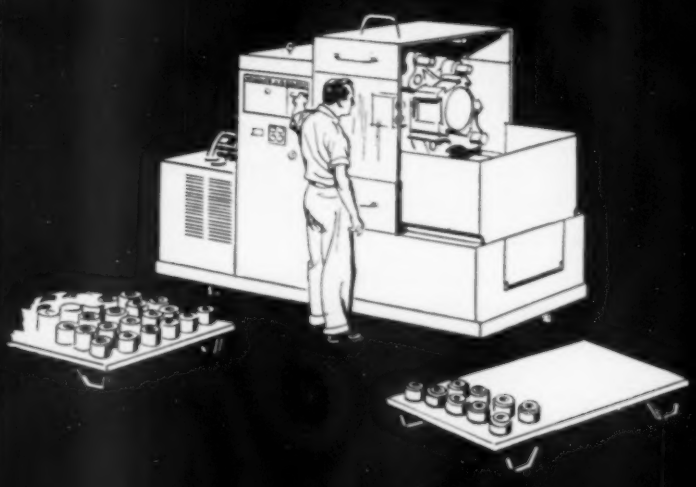
1 Cut bar stock into slugs or blanks using the automatic cut-off method best suited to the particular job. There are four to choose from: powered band saws and hack saws, cold or circular sawing and abrasive wheels.



2 If the part requires a large diameter bore, "punch" a starting hole with a low-cost drill press operation. Drilling can be free as the automatic saw operator can easily tend both machines.



3 Versatile, quick-to-setup Warner & Swasey ACs (Single Spindle Chucking Automatics) provide fast, automatic machining of precision parts in all lot sizes—even as few as a dozen pieces.



If only one operation is required, the finished parts are ready for assembly, storage or shipment. A second operation, if needed, can be performed without additional direct labor cost as one operator can easily tend two AC machines.

At The DoAll Company

Slugging gives production savings

over 52% on this part

For fast, economical, small-lot production of gear blanks and similar shapes, leading shops are turning to Slugging. Slugs are cut from solid bar stock by accurate, high-speed automatic saws—then processed into precision parts on Warner & Swasey Single Spindle Automatic Chucking Machines. Savings in direct labor dollars up to 65% are not uncommon.

Today's modern Slugging technique permits the use of smaller capacity automatic chuckers to produce precision parts that formerly required large capacity bar turret lathes. Slugs are easier and cheaper to handle than whole bars—they can be sawed from the solid bar faster than cutoff with a parting tool on the lathe—also, when required, stock in large diameter bores can be drilled out more economically on low-overhead drill presses.

Warner & Swasey Single Spindle Automatic Chucking Machines offer definite advantages for the Slugging process. Their quick setup features, coupled with fast, accurate, automatic operation, provide economical production of even the smallest lot sizes.

At The DoAll Company, Savage, Minnesota, plant, comparative machining of a 60-piece lot of 1⅝" diameter steel rollers showed a savings of 12.4 hours. Turret lathe time was 23.6 hours; DoAll power band sawing time plus "AC" machining time totalled only 11.2 hours—reflecting an overall savings of 52.5%. On this *simple* job, the comparison was even more striking because chuckers, as a rule, show greater cost advantages when the work is more *complex*.

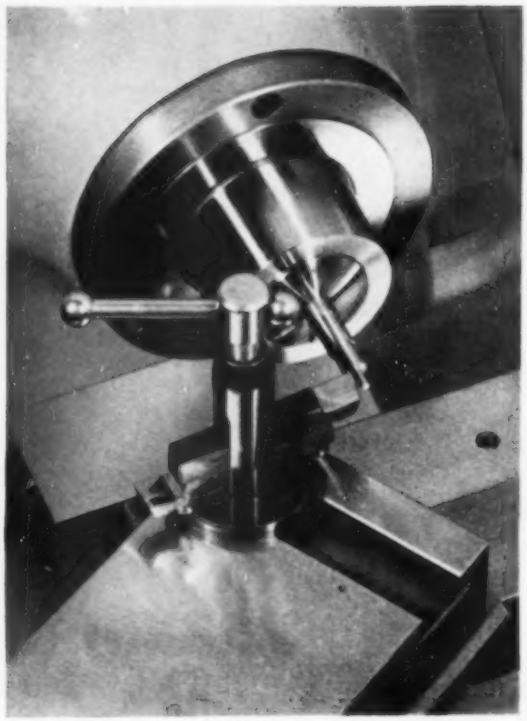
Why not have a Warner & Swasey Field Engineer check your operations and see if Slugging can help reduce machining time, lower production costs—while increasing overall profits.

For more detailed information, write us for your free copy of our latest 26-page engineering report on the "Economics of Slugging".

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

dream that came true.



When

ACCURACY

REALLY COUNTS

SPECIFY:

HARDINGE

PRECISION DRAW-IN COLLETS

FOR YOUR

LATHES-MILLERS-GRINDERS

CARRIED IN STOCK FOR PROMPT DELIVERY IN:

Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto, Montreal

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

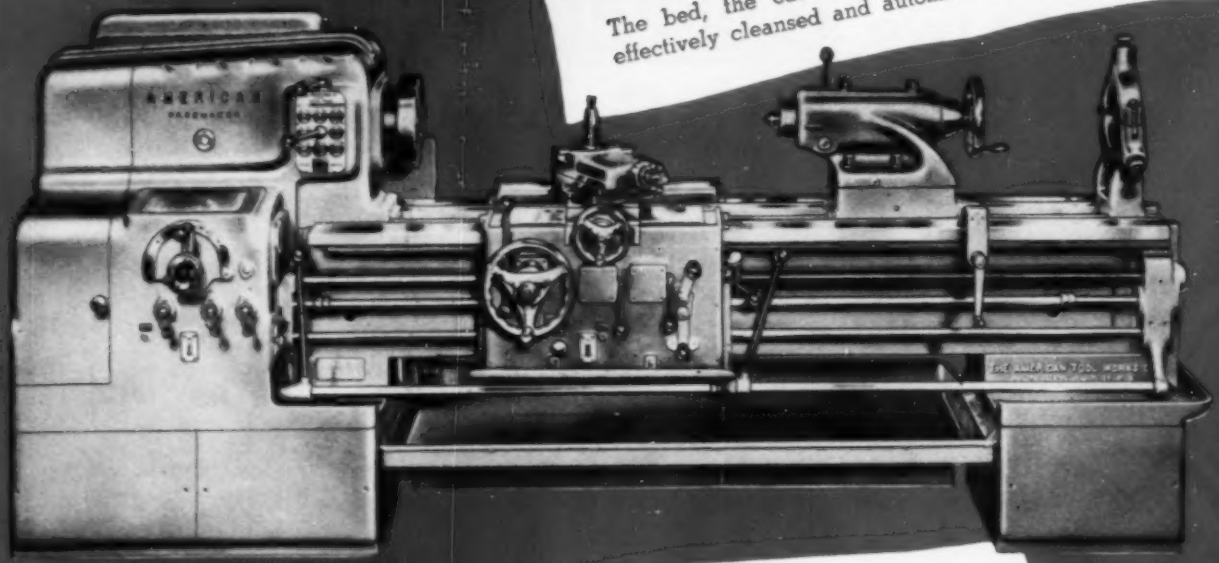
A dream that came true.

SAFETY ...a REALITY!

Safety of operation is a reality offered by the new DeLuxe "AMERICAN" Pacemaker Lathe: safety not only for the operator but for the lathe and work as well.

All operating units are enclosed and automatically oiled.

The bed, the carriage and the cross slides are effectively cleansed and automatically oiled.



The power longitudinal and cross feeds are separately controlled to avoid confusion and protected against overload and accident by self-adjusting safety clutches.

The power length and cross rapid traverses are separately controlled and protected by spring actuated multiple disc safety clutches. When power length rapid traverse is engaged the longitudinal feed handwheel is de-clutched to protect the operator and is automatically re-engaged when traverse is released.

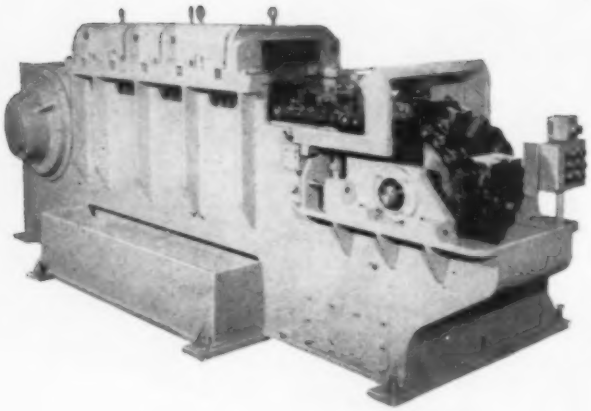
Power Feeds and Power Rapid Traverses are interlocked and cannot be engaged simultaneously.

Spindle coasting endangering operator by rotating chuck or work while miking or measuring is prevented by patented safety starting clutch and brake which also protects machine against excessive overloads.

These valuable and exclusive features are illustrated and described by bulletin No. 116—yours for the asking.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



In times like these,

squeezing the last ounce of production out of every dollar invested in equipment is not merely desirable—*it's an absolute must.*

Pursuing this objective, an important manufacturer of automotive parts achieved results that they consider highly satisfactory, in the production of the Piston Nut Rack shown here.

Using two LAPOINTE continuous BROACHING MACHINES

one for roughing and the other for finishing, production is 800 completely broached racks per hour . . . with reserve capacity still available if needed. The picture indicates the large amount of stock that is removed in straddle-broaching the flats and adjacent angular surfaces.

An efficient partner for the harried production man, is the Lapointe Continuous-Broaching Machine. It's available in a series of four standard sizes — all ruggedly built — with the Lapointe electro-mechanical drive for plenty of power, uniform broaching speed, and *smooth, chatterless operation.*

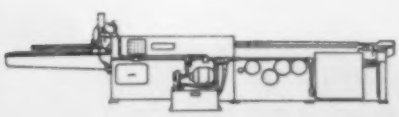
If you're really serious in your desire to cut production costs, you should consider converting to broaching — *modern broaching,* that is, by Lapointe. Send for Bulletin CH-1.

THE LAPOINTE MACHINE TOOL COMPANY

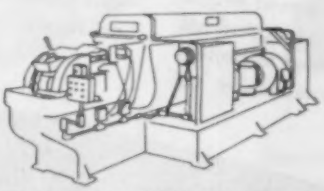
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

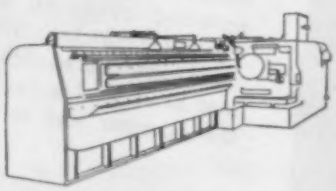
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



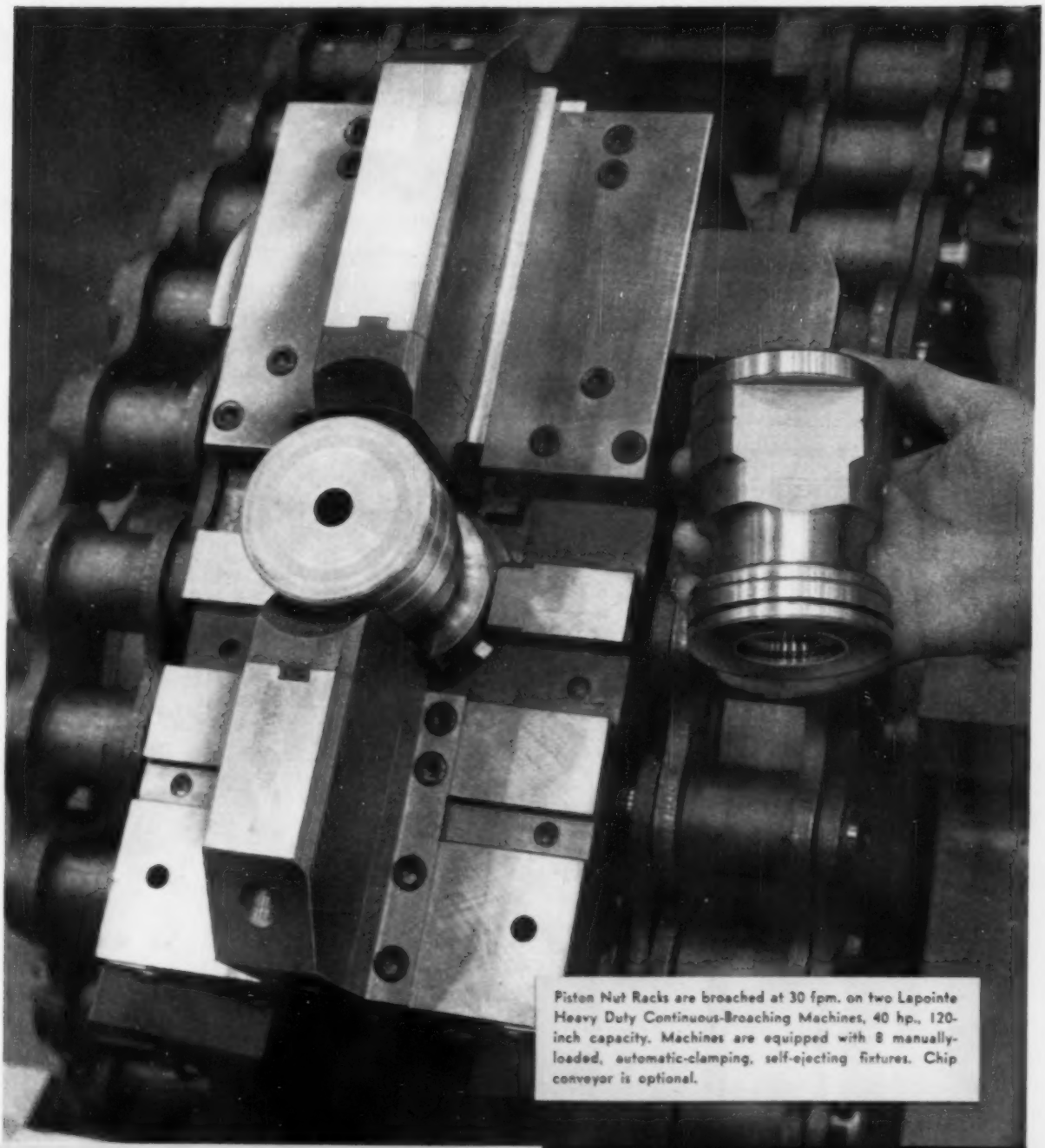
60" STROKE HORIZONTAL, ELECTRIC



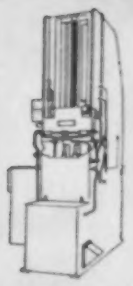
CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

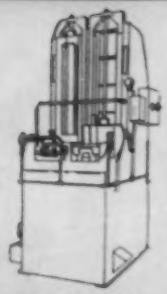


Piston Nut Racks are broached at 30 fpm. on two Lapointe Heavy Duty Continuous-Broaching Machines, 40 hp., 120-inch capacity. Machines are equipped with 8 manually-loaded, automatic-clamping, self-ejecting fixtures. Chip conveyor is optional.



VUE-7 VERTICAL PULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

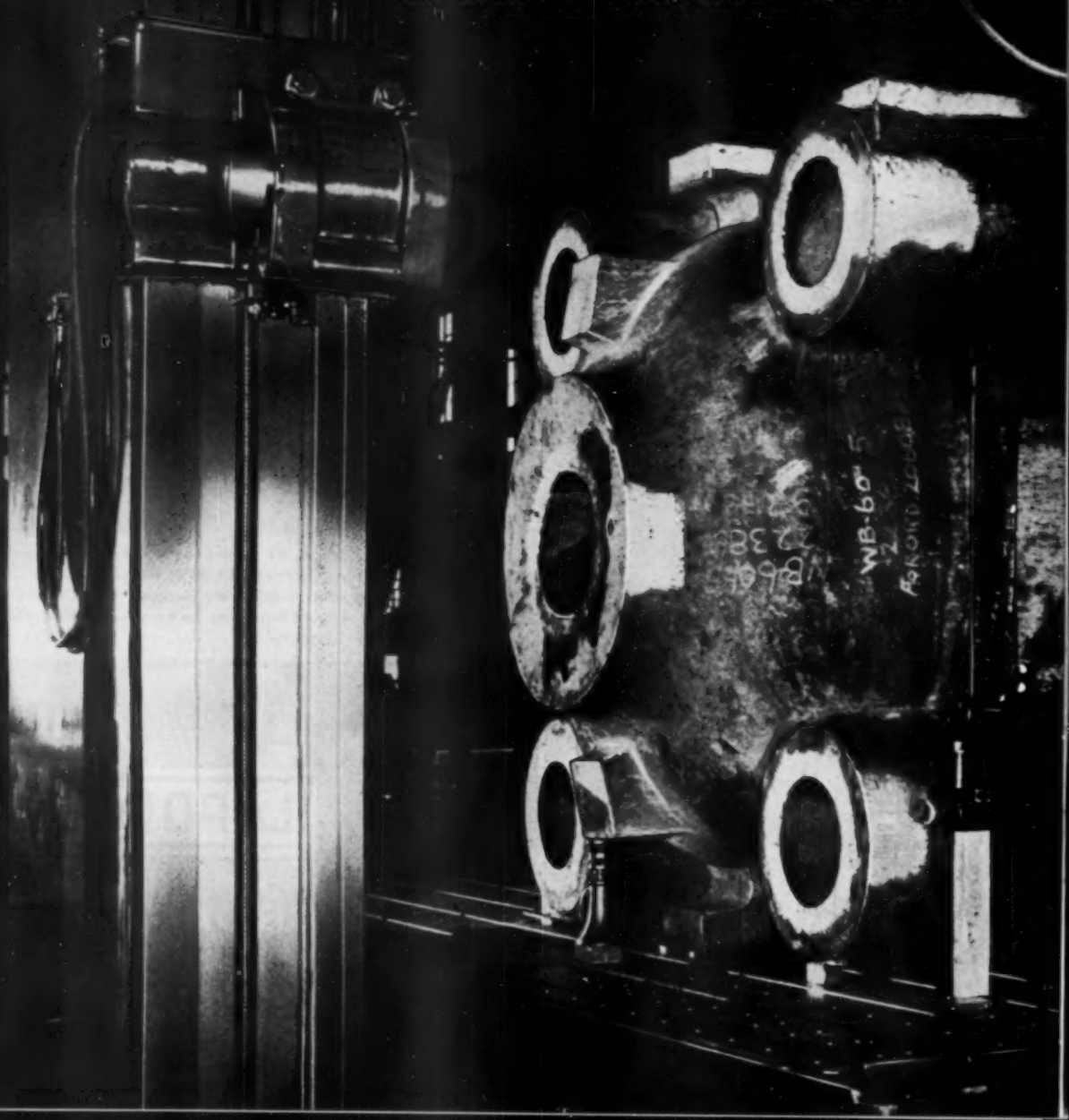
known to be the best in

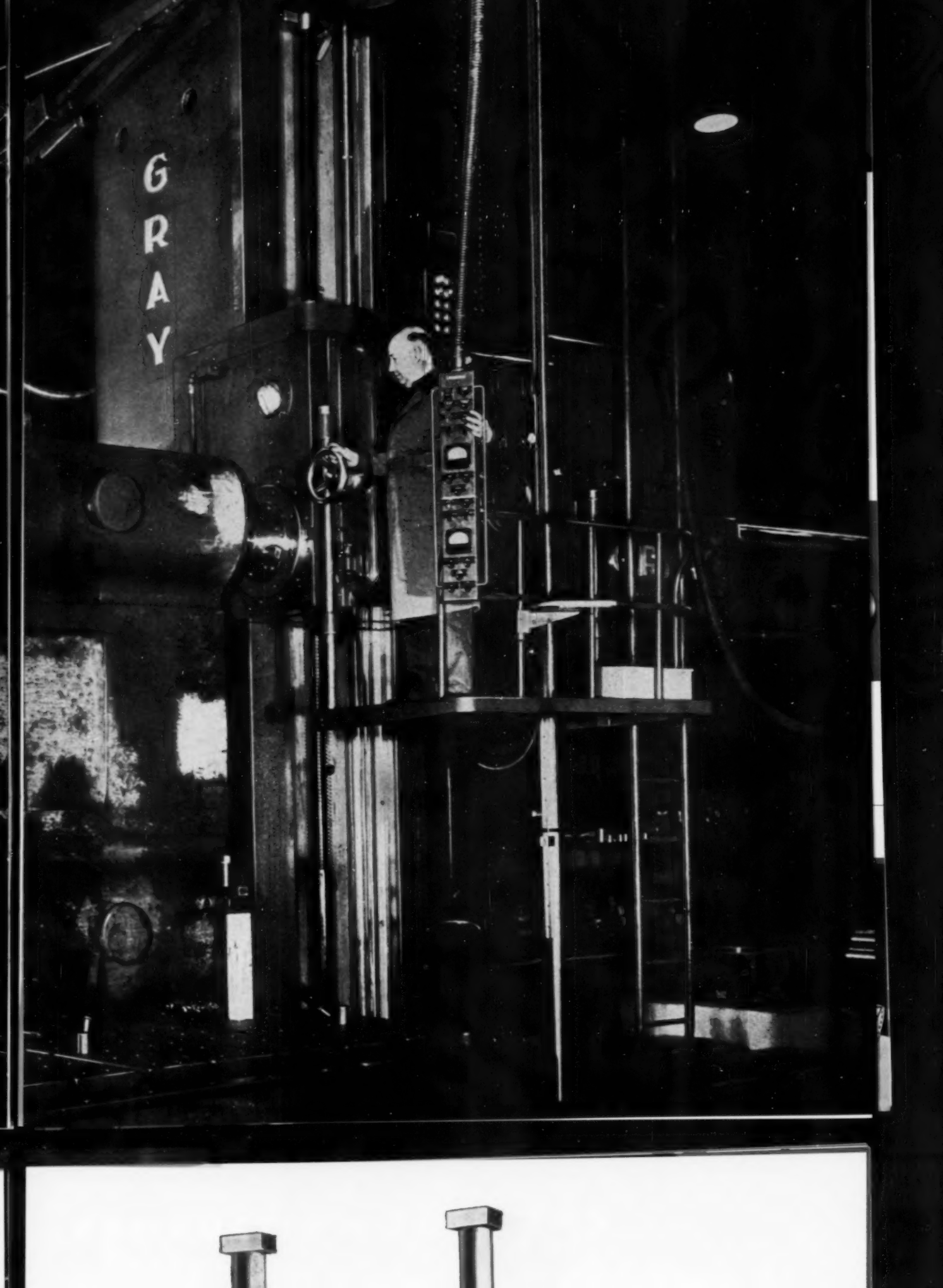
BROACHING

brute POWER

. . . flows from this Gray giant at the touch of a button.
Its massive design and tremendous rigidity guarantee heaviest
carbide milling. Magically, precision boring to minute
tolerances is equally available on this 8" Gray Horizontal.
Its amazing convenience permits small machine speeds
for the first time in the elephant field.
That's why . . . large jobs don't grow old on a Gray.

The G. A. GRAY Co., Cincinnati, Ohio



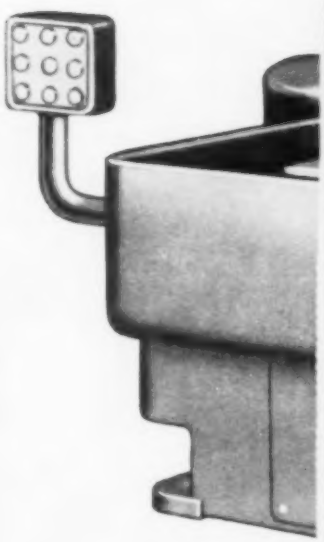

GRAY

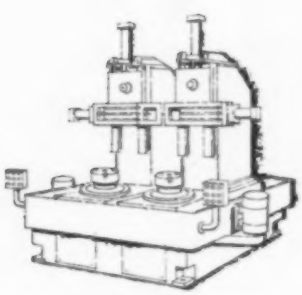
News in Machine Tools

New M&M Multi-Spindle Two Column Vertical Turners add flexibility to standard machining operations

Here's a machine tool designed for precision turning, boring and facing operations with versatility for long and short run production jobs. Features:

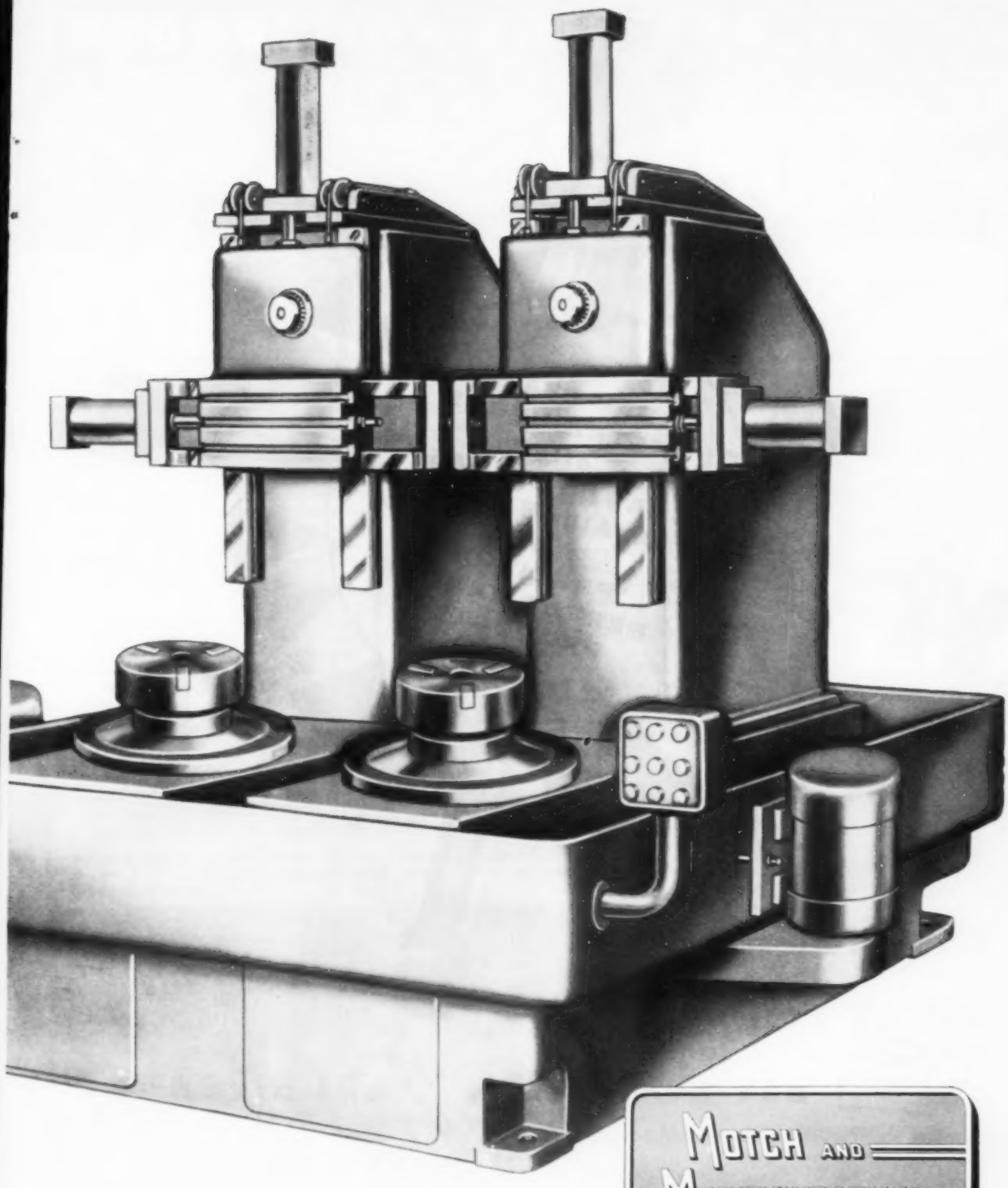
- spindles will accommodate *any* type chuck including air operated draw bar
- automatically-lubricated tool slides
- slide ways of hardened and ground steel with tapered gibs for accurate alignment and easy adjustment
- hardened adjustable slide stops
- hydraulic or cam-actuated slide-feed, rapid traverse and rapid return
- separate controls for each spindle and slide unit to permit their independent operation on two-spindle machine
- on four-spindle, two column machine, spindles are controlled in pairs, separate controls for each pair
- "building block" design for easily-made tooling and slide changes to accommodate a wide variety of work
- design features accessibility for simple, speedy maintenance of spindles, motors, hydraulic cylinders and/or cams and slides for minimum downtime





We can show you, in detail, how this new adaptable metal-working machine will improve your present machining operations. Call your nearby Motch & Merryweather representative, or write: Motch & Merryweather Machinery Company, 1250 E. 222nd St., Cleveland 17, Ohio.

BUILDERS OF AUTOMATIC PRECISION CUT-OFF.



MOTCH AND MERRYWEATHER

Machine Tool Manufacturing Division
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AIR BRAKE DIV. OF WESTINGHOUSE AIR BRAKE CUTS F.T.F. TIME 25%

PRODUCTION POINTERS from GISHOLT

MASTERLINE GISHOLT SINCE 1887

FISHER GOVERNOR COMPANY TRIMS F.T.F. TIME

Cuts costs through Fastermatic features and accessories

You'll find some good tips in this job story—tips that tell how Fisher Governor, Marshalltown, Iowa, cuts costs by taking full advantage of the features and accessories of the Gisholt MASTERLINE Fastermatic Automatic Turret Lathes.

The job is on cast-steel stuffing box heads. Two Gisholt 2F Fastermatics handle first, second and third machining operations.

Here's the machining sequence: (Sections in italics show where a specific machine feature or accessory is used to cut costs.)

Operation 10: Chuck on large O.D. X, locating at Z in 18", 3-jaw air-chuck. *Hex turret is set at non-index* and rough-turns F-E. *Both front and rear cross slides operate during this one pass* to chamfer A and face B. F.t.f. time: 2.1 minutes.

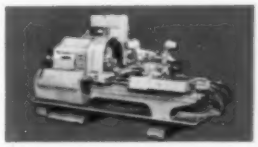
Operation 20: Chuck at X, locate at B in 18", 3-jaw air-chuck. Hex 1: rough-bore P *while front cross-slide tools* rough-face Z, chamfer T, and *rear cross-slide tools* finish-face V-S. Hex 2: drill M, chamfer N and cut groove U. Hex 3: semi-finish bore M, size W, chamfer Y-O. Hex 4: semi-finish-bore P, chamfer R. Hex 5: finish-bore M and size P, holding to .001". Hex 6: finish-ream P. Floor-to-floor time: 10.3 minutes.

Operation 30: Special fixture centralizes part on W, clamping back against Z with clamp at B. Hex 1: rough-turn F-E, chamfer corner at C, start-drill and rough-form J. Hex 2: drill K to depth, chamfering L at base of hole; semi-finish J and finish-turn F-E. Hex 3: semi-finish-bore K, chamfer J, using 10° finish-chamfering tool while *front cross-slide tools* finish-face H-D and chamfer G. Hex 4: finish-bore K. Hex 5: thread F, *using full-length lead screw threading attachment* and self-opening die-head. Hex 6: finish-ream K. F.t.f. time: 8.1 minutes.

To eliminate tool tracks on all three operations, *both front and rear cross slides have .015" tool relief in either direction*, used as required.

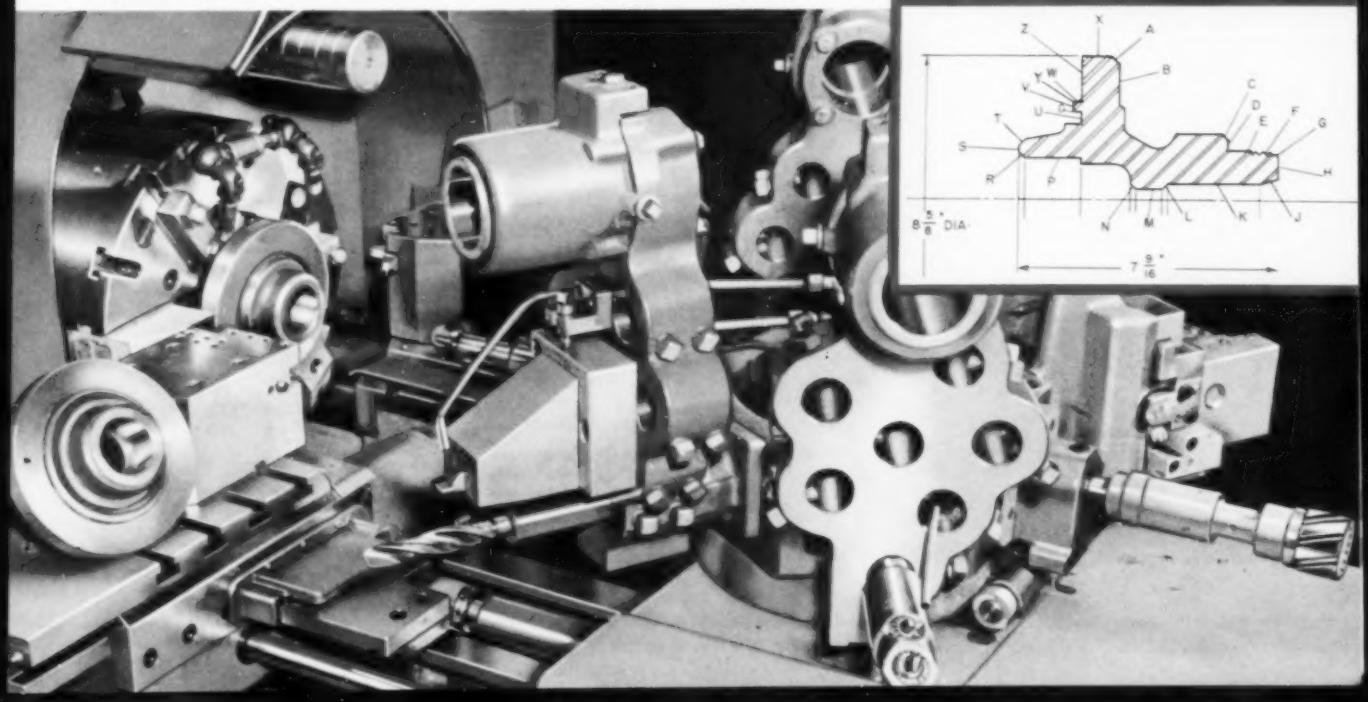
One operator handles both machines, uses simple Fastermatic Job Record Sheet to speed similar setups on variety of sizes. Full-length lead screw threading attachment provides accurate lead for threading.

Ask for new Fastermatic Catalog 1179-B.



Rough workpiece and finished part showing surfaces machined in the three operations.

Second machining operation tooling and workpiece. Smooth hydraulic feeds assure accuracy and fine finish on all surfaces. Automatic cycle permits operator to handle second unit for maximum efficiency.



HOW TO SPEED BALANCING AND CUT HANDLING COSTS

MASTERLINE GISHOLT SINCE 1887

AIR BRAKE DIV. OF WESTINGHOUSE AIR BRAKE CUTS F.T.F. TIME 25%

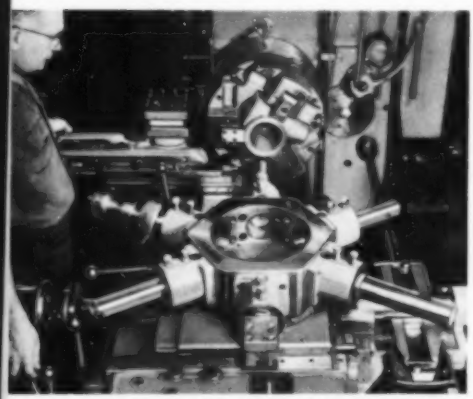
Chucking fixture, special loader and cross-feeding turret simplify operation

Here's a fixture job story to save for future reference. Previously, the workpiece—a cast iron, automatic slack-adjuster casing for railroad use—caused problems in both chucking and machining. Today, Westinghouse Air Brake Company's Air Brake Div., Wilmerding, Pa., plant is handling it in two fast operations. Here's how:

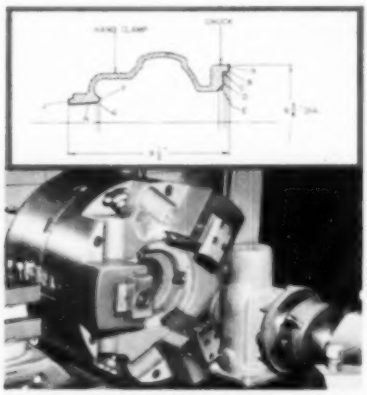
First, need for expensive special tooling is eliminated by using a Gisholt MASTERLINE 2L Saddle Type Turret Lathe, equipped with a cross-feeding hexagon turret with a taper attachment. Chucking the rough workpieces is fast and easy. A turret-mounted expanding loader-centralizer supports the part during loading in a 3-jaw, bonnet-type chucking fixture, operated by and mounted on the face of an 18", 3-jaw air chuck. The piece is located longitudinally from the turret and chucked on the large 6⅜"-diameter flange, with three hand-clamp screws supporting the work at the rear.

Let's look at the first machining operation. Surfaces are indicated on the drawing shown. Hex station 2 straight-bores H; station 3 rough-faces A-D, using hex turret cross feed with two tools in holder. Hex 4 straddle-faces F-J, using hex turret cross feed and two tools in bar, and reverse-feeds to finish surfaces and remove tool tracks. (Reverse feed is a standard feature on all Gisholt turret lathes.) Spindle rotation is reversed and tools on hex stations 5 and 6 rough- and finish-taper-bore H and chamfer G. Front square turret tools finish-bore C, finish-face A, chamfer B-E. Floor-to-floor time is a fast 8.4 minutes.

The same basic tooling arrangement handles the second operation on the other end of the part in just 5.5 minutes floor-to-floor time.

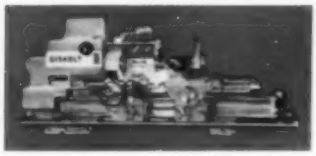


First operation turret-tooling. Cross-feeding turret eliminates special tooling costs, handles taper-boring and cross-facing operations quickly and economically.



Turret-loader and chucking fixture. Three extended jaws chuck on 6⅜"-diameter flange, with one jaw pivoting for loading, unloading clearance. Part supported by hand-operated clamp screws at back of fixture.

Special loader, designed by Westinghouse Air Brake tool engineers, speeds chucking operation. Standard tools on cross-feeding hex turret with taper attachment cut costs, handle straight or taper boring and facing operations to required accuracy.



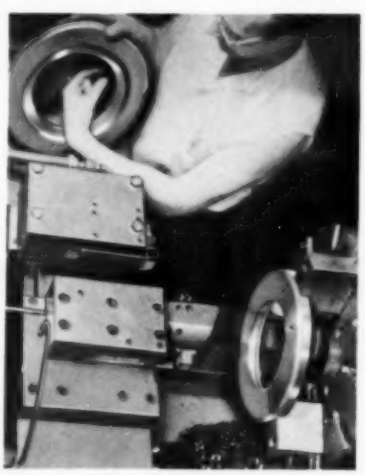
EXTRA OPERATIONS ELIMINATED WITH THIS SETUP

Combines table feed and slide movements to machine maximum number of surfaces in one chucking

Here's another good job to add to your files. It shows you how to obtain complex feeding motions with minimum tooling investment, using the versatile Simplimatic. This setup handles two different sizes of steel rear-axle drive gears. 50 h.p. motor assures ample power for all cuts.

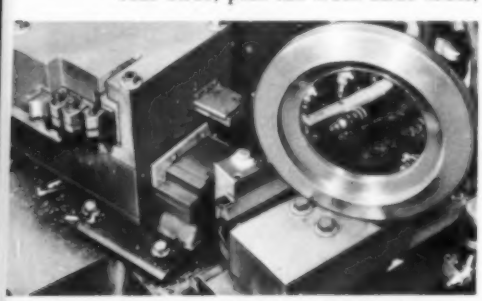
Check the first operation. A 21", 3-jaw air-chuck grips the part on the large O.D., locating against the rough beveled face. The platen table traverses forward, then changes to feed as tools on the rear independent slide rough- and finish-bore. As this operation is completed, more tools on the rear slide, plus the front slide tools, are in position for machining. Moving back from the machine center line, standard rear slide feed movement back-faces and back-bores the web, and chamfers at the front and back of the bore. Rear slide tools then reverse-feed to eliminate tool tracks, clean up the cuts, and clear for withdrawal, while tools on the front independent slide face and chamfer the large O.D. The platen table then reverse-traverses and slides return-traverse to starting position. Complete f.t.f. time is only 2.35 minutes for the first operation.

The same operator handles another Simplimatic to perform the second operation on the other side of the part. Work is held in the bore with a 21", 3-jaw air-chuck. This time the platen table merely positions the tools. Front slide movement turns the O.D. and forms a radius on the edge of the co-bore, while three cam-controlled tools on the rear independent slide rough- and finish-machine the beveled face and form a radius on the O.D. edge. F.t.f. time—2.5 minutes.



First operation tooling. Tools (facing operator) on rear slide rough- and finish-bore, using table feed. Tools on opposite side back-face, form co-bore and chamfer back edge, using standard slide movement.

Ask for new Simplimatic Catalog 1159-C.



Second operation. Note three leading tools on rear slide, controlled by cam at rear of block to generate beveled face on part. Slide set at correct angle minimizes tool travel required from cam.

Simplimatic handles extra surfaces through table feed combined with standard slide movement, eliminating extra handling and secondary operations. Flat platen table permits slide location at exact angle required, minimizing special tooling costs.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT

HOW TO SPEED BALANCING AND CUT HANDLING COSTS

Integral correction unit lets operator complete balancing and correcting from one station

This setup shows how a well-known automobile manufacturer cut balancing time and costs on a variety of automatic transmission parts. It shows how the addition of a correction-drilling unit to a standard Gisholt 1SV1 Balancer permits measurement, location, correction and inspection for balance to be handled from one station.

Workpiece shown on adapter. Note numbered reference dial for fast, accurate angle location and hydraulic-operated thrust support at base of part.

Here's how a first turbine disc and hub assembly part is balanced. Because the parts are narrow and of large diameter, only a single-plane balancing operation is required so the lower cost 1SV1 Balancer is ideal. Although location is in the splined bore, close balancing accuracy is easily maintained, using an air-operated expanding splined arbor.

A numbered disc rotates with the work. The unbalance angle is indicated on this disc by a strobe lamp in the same visual plane as the amount meter. The amount meter is calibrated in terms of drill depth. A graduated reference dial on the turnstile that feeds the drill permits the operator to drill to the indicated depth quickly, with minimum chance of error. He merely matches meter reading to the depth dial reading to correct for unbalance.

The drill head is mounted 30 degrees from the vertical for loading-unloading clearance. A hydraulic-operated thrust support at the base of the part compensates for vertical and horizontal thrust during the correction drilling.

A production rate of 60 pieces per hour is realized by adding a correction drilling unit to the standard 1SV1 Balancer. Saves time, requires minimum floor space, prevents error by letting one operator perform all necessary operations.

Note simple, compact arrangement that permits measuring, locating, correcting and inspecting for balance at one station.

POWERS REGULATOR SAVES 40% ON THESE PARTS

Hydraulic drive automates production, improves quality

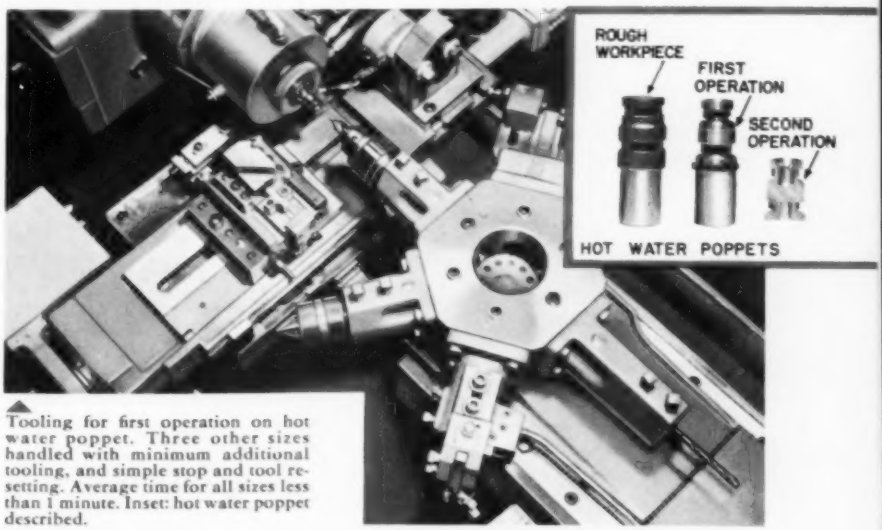
Take a look at these cast bronze hot and cold water poppets, handled with this setup at the Powers Regulator Co., Skokie, Ill., plant. A number of surfaces are automatically machined to close tolerances, using a Gisholt MASTERLINE No. 3 Ram Type Turret Lathe with independent hydraulic drive units for the turret and cross slide.

Here's how a typical 2⅜"-long, ¾"-diameter hot water poppet is handled in two fast operations. Each casting has a chucking lug turned to size, with the end faced for location against a stop within an outside, air-operated collet chuck. Hexagon turret tools center-drill the end. Then a live center supports as the O.D. contour is formed from the rear of the cross slide. Next, the O.D. edge is chamfered and the piece is rough- and finish-drilled. Two tools in a special holder on the last hex turret station size two diameters on the O.D. A special, cam-operated front cross-slide tool generates two angular seating surfaces on the O.D. within .0003" to complete the operation in only 47 seconds f.t.f.

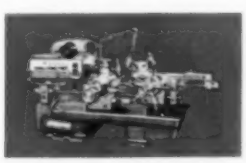
For the second operation on the opposite end, the part is held on the machined O.D. in the same collet chuck, and located against the same stop. Front cross-slide tooling isn't used, but remains in place. The chucking lug is faced off from the rear of the cross slide. Except for different size drills and minor cutter adjustments, the same tooling setup is used to center-drill, rough- and finish-drill, and chamfer the O.D. and I.D. edges to complete the part in only 38 seconds f.t.f. time.

Automatic cycle cuts time, assures correct speeds and feeds on all surfaces, for increased accuracy, uniform quality, longer tool life. Operator simply loads...unloads ...and initiates cycle.

Ask for new Catalog 1182-A on Ram Type Turret Lathes with hydraulic drive.



Tooling for first operation on hot water poppet. Three other sizes handled with minimum additional tooling, and simple stop and tool resetting. Average time for all sizes less than 1 minute. Inset: hot water poppet described.



MACHINES WITH NEW MACHINE GUARANTEE

MASTERLINE
GISHOLT SINCE 1887

HOW FAIRBANKS-MORSE CUT TIME 27% ON LINERS

Tandem tool slides handle 16 surfaces in one chucking

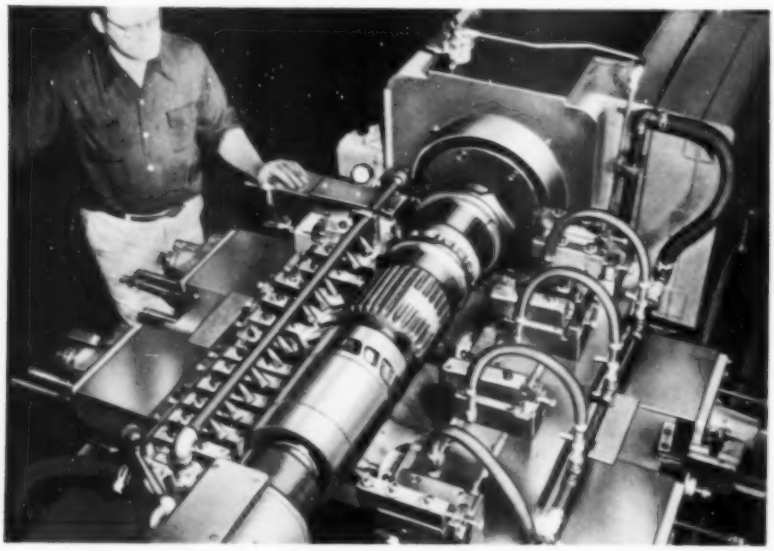
Machining multiple surfaces on long workpieces? Interested in maintaining concentricity and parallelism by completing all work in one handling? Then this setup on the Gisholt MASTERLINE No. 24 Automatic Production Lathe will interest you.

Here is how the Fairbanks, Morse & Co. plant at Beloit, Wis., is handling O.D. machining operations on one type of diesel cylinder liner. The 42½"-long, 9"-diameter parts are loaded on an air-operated, pin-type expanding mandrel. A retractable stop permits longitudinal location in one of the liner ports. A heavy-duty tailstock, mounted on an independent slide, is traversed in to the center line to provide support at the end of the mandrel.

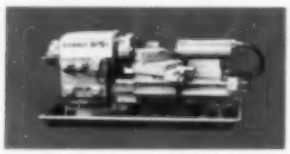
Two independent tool slides, linked together to operate as a unit, are mounted on extra wide front and rear carriages. After the part is chucked, the front slides feed to depth and then the carriage feeds longitudinally as 13 tools rough-turn ten different diameters. Three tools split up each of the two longest cuts to reduce machining time. Two diameters, closest to the spindle, are handled by one tool on a cam-operated sliding tool holder. At the same time, six tools on the rear carriage slides feed in to face both ends, face two shoulders and form two radii.

After machining, the operator retracts the tailstock quill and its supporting slide moves the tailstock away from center, clearing the mandrel for unloading. F.t.f. time: 6 min.

Tools and stops are quickly reset for a similar finishing operation on these parts.



Multiple surfaces on large parts are more easily handled on rugged No. 24. Basic design offers more tooling flexibility and automatic cycle frees operator for other work.



◀ Rear overhead view showing 42½"-long, 9"-diameter cylinder liner on tailstock-supported mandrel. 50 h.p. main drive motor provides ample power for machining loads imposed by 19 separate tools.

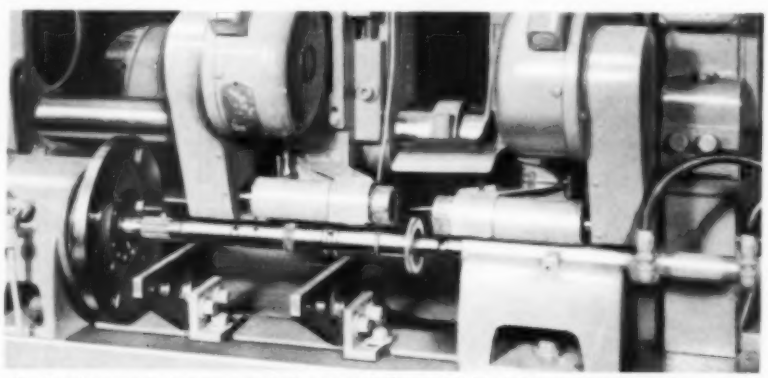
2-IN-1 OPERATION FINISHES FLAT SURFACES FASTER

Two opposing faces Superfinished at the same time

Relatively low-cost special tooling is used on this Model 51A General-Purpose Superfinisher, to permit Superfinishing opposing faces on steel transmission output shafts at high production rates. The workpieces are held between centers and driven from the splined end. Simple, adjustable loading rails speed work handling.

Here's the operation in a nutshell: After loading, the operator presses the cycle start button and two rotating Superfinish quills, carrying cup-type wheels, engage the opposing thrust and seal faces. Each wheel removes .0003" to .0004" stock to clean up all surface defects resulting from grinding and heat-treat. In addition, the 30-40 micro-inch ground surfaces are reduced to 8 micro-inches RMS. Total f. t. f. time: 24 seconds.

Both the 51A and the larger capacity 52A General-Purpose Superfinishers are easily adapted to jobs like this. There is ample space for rigidly mounting special units on the overhead support and traverse bars. Setup is fast for either small lots or long production runs. Because the Superfinishing cycle is automatic, the operator has time to handle another unit or perform other work.



▲ Steel transmission output shaft on specially tooled Model 51A. Opposing faces simultaneously Superfinished by cup-type wheels to 8 micro-inch RMS finish in only 24 seconds f.t.f.

Superfinishing opposing faces in one fast operation saves time, improves accuracy. Also provides finer finish as grinding and heat-treat defects are removed, exposing true base metal for longer service life.

Ask for new Superfinisher Catalog 1169-B.

No. 3-458
701

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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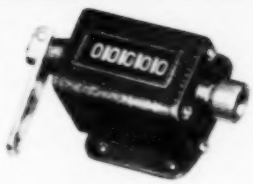


SMALL RESET COUNTER

A compact, rugged reset counter for moderate duty in parts inspection, quality control, conveyors, machine tools, light presses, etc.
Dimensions: 1¾" long, 1 19/64" high, 1 3/16" wide.
Speed: Up to 1000 counts per minute.

BOX-TYPE RESET COUNTER

For punch press installations, conveyors, metal-working equipment, die casting, plastic-molding, rivet, spring and wire machining, or any installation requiring a heavy duty counter.
Dimensions: 4¼" long, 2 5/32" high, 3⅜" wide.
Speed: 500 counts per minute.

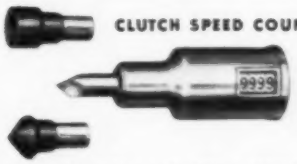
RESET MAGNETIC COUNTER

For remote indication of machine operation from plant to office.
Dimensions: 3 15/16" long, 2½" high, 1⅝" wide.
Speed: Up to 1000 counts per minute.
Coils: 110V-AC are standard. Other voltages are available. Panel mounting feature also available.

HAND TALLY

For quick spot-checks of production or performance.
Dimensions: 1 17/64" long (to end of reset knob), 1¾" deep, 2" high.
Counts one for each depression of the thumb lever, and resets to zero by a turn of the knob.

CLUTCH SPEED COUNTER



For checking to make sure that the machine is operating at the required R.P.M.
Dimensions: 3¼" long, ⅞" max. diameter. Non-Reset.
Internal clutch operates counter only when rubber tip is pressed against the shaft.

Everyone can count on

VEEDER-ROOT

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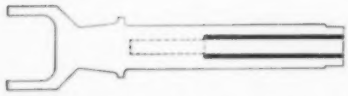
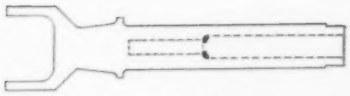
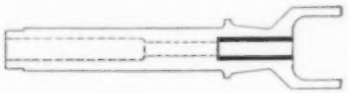
1. Solid bore—feed 5¾" per minute.



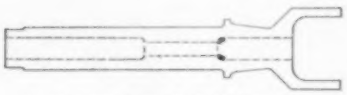
2. Counter bore—feed 8" per minute.



3. Form radius—feed 5¾" per minute.



4. Reverse part, solid bore—feed 5¾" per minute.



5. Form radius—feed 5¾" per minute.

6. Part finished accurate to ± .001" on length and concentricity, 25 to 30 micro-inches on finish! Part is forging, length 14⅛", 4130 steel, Rockwell 39 to 43-C.

This horizontal pin machined

8 TIMES FASTER . . .

on the Rapid Borer

Formerly, this aircraft part was rough drilled, reamed, radius formed, ground and honed. Operation called for turret lathe, grinder and honing machine. Even with experienced operators, incidence of spoilage was high because of precision requirements.

On the LeBlond-Carlstedt Rapid Borer, there is only one set-up. Part is completed, *finish bored* in 5 simple operations. Cycling is automatic. Workpiece spoilage is down. Operation is so simple that unskilled operators are quickly trained. Currently 2 different sizes are being produced in lots of 300 to 400.

LeBlond-Carlstedt Rapid Borers will solid bore, trepan or counterbore holes 3 to 8 times faster than by the conventional D-bit method! Hole capacity from 5/16" to 4¼" diameter. Handles symmetrical work—round, square, octagonal, tapered or stepped—wide variety of hole diameters and depths, work sizes. Available in three sizes, No. 15, No. 30 and No. 60.

Tell us about the holes you'd like to produce faster. Large holes or small. If the Rapid Borer can handle the job, you'll produce them faster than ever before. Write for Bulletin LC 501A.

LeBlond customer:

Peter J. Salmon Co., Glenside, Pa. Contract machining, specialists in high precision work. Semi-production machining, drilling, honing.

According to Peter J. Salmon, Owner, "*No machinery investment we've ever made has reduced our immediate costs as dramatically as the LeBlond-Carlstedt Rapid Borer. Actually, it competes cost-wise with any other holemaking method for holes as shallow as one inch. On longer holes there's no comparison! Not with the Rapid Borer, which can feed over 30" per minute!*"

THE R. K. LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

LeBLOND of Cincinnati

World's Largest Builder of a Complete Line of Lathes for more than 71 years

How Fred Lee

Stan Bozek, Abrasive and Methods Engineer at Marlin-Rockwell Corp., Plainville, Conn., discusses new form grinding technique for ball bearing races with Fred Lee, Manager of Bay State's district office in Bristol, Conn.

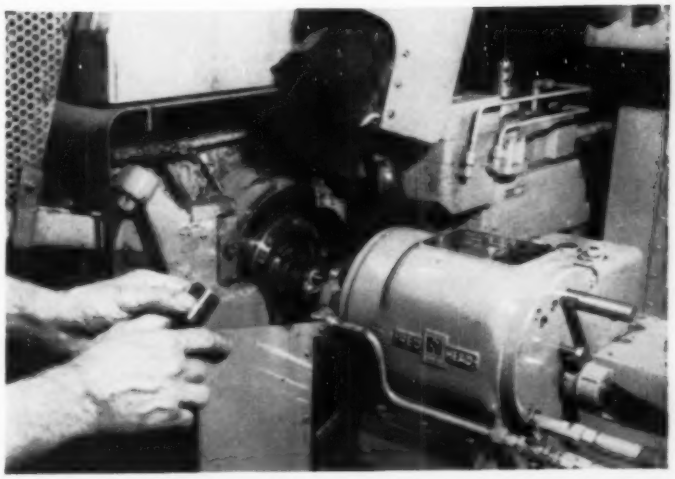
helped revolutionize the grinding of bearing races

Ball bearings used in missile guidance systems and other highly critical applications have to have super-accurate races . . . but cost is vitally important, too. That's why Marlin-Rockwell Corp., of Plainville, Conn., was one of the first bearing manufacturers to switch from the oscillating rubber wheel grinding technique to form grinding.

Bay State's Fred Lee, recognized as one of the country's leading authorities on bearing grinding, was called in to discuss the problem with Marlin-Rockwell engineers. After exhaustive study, he specified semi-friable, fine grit, medium grade vitrified wheels that varied in size from ½" to 20" diameter.

Result: 50% closer confinement of race curvature, 100% improvement in roundness and consistent uniformity in multiple production runs. General foreman John Gworek, veteran of 30 years of precision bearing grinding, says flatly: "It's the *only* way to grind them."

Like Fred Lee, your own Bay State representative may be best known as an expert in a particular type of grinding but his general knowledge of grinding techniques is both wide and deep. **Better grinding at lower cost . . . that is his business.**



Form grinding 2 ball races at the same time on water pump bearings with Bay State vitrified wheel, diamond dressed only every sixth piece, on Heald 1701 Form Grinder.

Rough form grinding O.D. contour of inner races with 20" diam. Bay State vitrified wheel (Crush formed) on Cincinnati Microcentric Grinder.

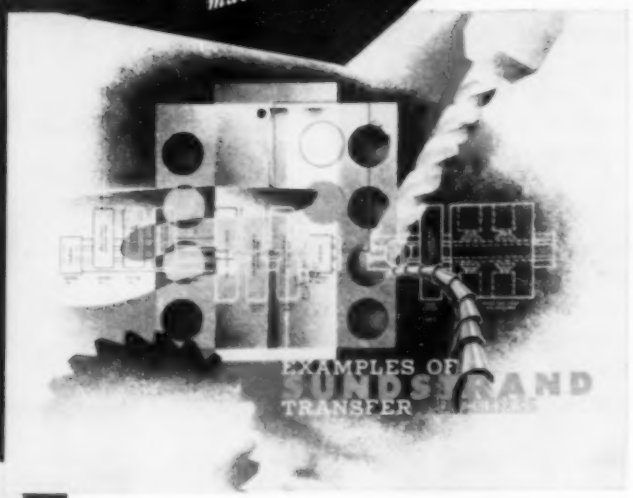
BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

SEE EXAMPLES OF **Work Transfer Pallet-Type Indexing MACHINES**

NEW SUNDSTRAND BOOKLET
shows "Engineered Production" answers to a wide range of machining problems



● More than 20 years' experience in engineering and building transfer machines are represented in this new Sundstrand booklet. The emphasis is on today's lines for crankshafts, cylinder blocks, transmission parts, electric motor frames, etc. Among the installations shown and operations described are: rotary indexing setups, pallet-type handling of nonferrous metal parts, lines with more than 40 work stations, even lines that permit flexibility normally believed impossible in high-production machines. All these have one factor in common — Sundstrand engineering, proved on numerous successful applications in scores of production plants.

Your copy will quickly show you how Sundstrand can engineer the answer to your production problems. Write for Bulletin 189 today.

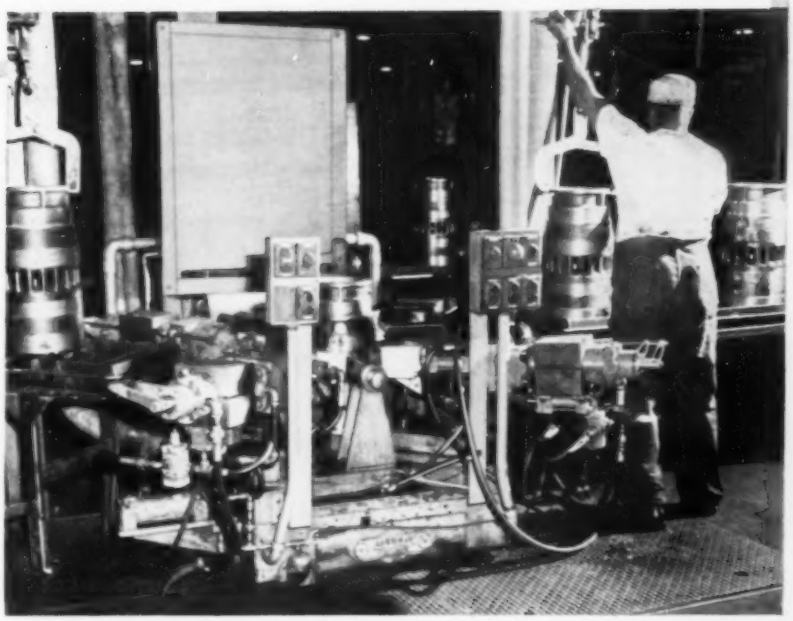
SUNDSTRAND MACHINE TOOL CO.

2533 ELEVENTH ST., ROCKFORD, ILLINOIS

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS | TRIPLEX RIGIDMILS | SPECIAL MACHINES

SUNDSTRAND "Engineered Production" Service"

Special 4-Way Broaching Machine Triples Cylinder Liner Output



• When it comes to the special jobs — like this one that calls for broaching air ports in cylinder liners — American's "Engineered Production provides immediate and significant benefits in higher production and improved accuracy. This job, requiring the finish broaching of 20 air ports in cast iron cylinder liners formerly took two men and two machines. Now — one man turns out three times as much work in a simple pushbutton-controlled cycle in which four ports are broached at one time.

There are other benefits, too. Tool change takes just 15 minutes and is handled readily by the operator since no special tool setting skills are required.

The same engineering skill and production experience that went into the design of this special machine, its broaching tools and fixtures, is behind every standard or special machine built by American. Most production needs can be met by the proper application of broaching tools and fixturing to one of the complete range of standard American surface, internal, or combination machines.

Write today for your copy of Bulletin A124 "Practical Broaching Methods."

"Engineered Production" Service FOR BROACHING

It takes All 3 for peak broaching performance

1 *Proper Broach Tool Design* — This logical first step in solving a broaching problem requires consideration of stock removal, length and width of cut, finish, tolerances, etc., so broach fixture and machine operate as a team.

2 *Specifying the Right Machine* — Production rate required, length and speed of stroke, floor space, and relationship with other production machinery are all considered before choosing the machine for a job.

3 *Efficient Fixturing* — This vital third link in the production chain enables production schedules to be met even with inexperienced operators because fixtures are provided with the skills "built in."

American BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL CO., ANN ARBOR, MICHIGAN

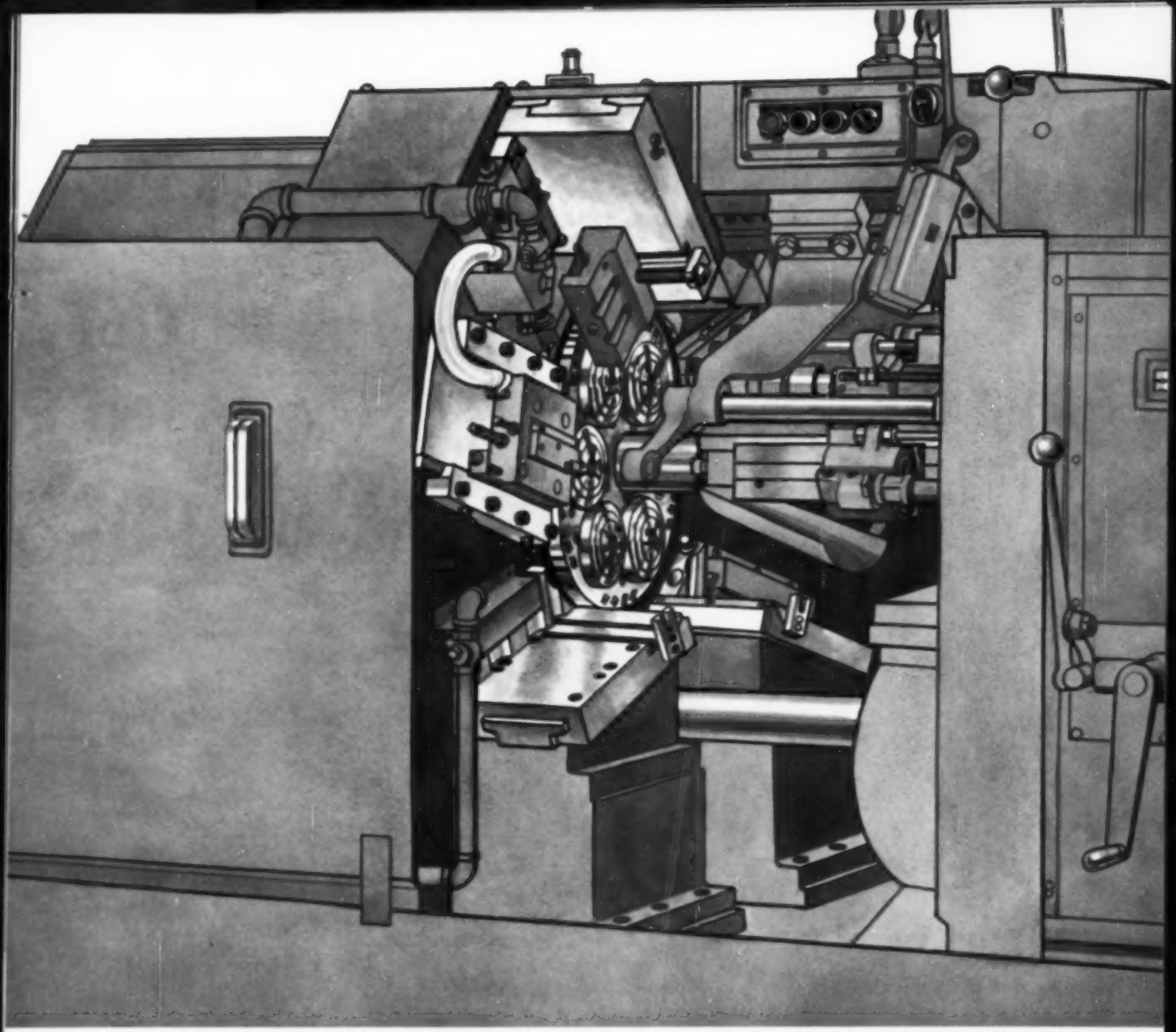
BROACHING TOOLS | THREE WAY | SINGLE RAM | HORIZONTAL | DUPLEX RAM | PRESSES

This is the new

MODEL

52

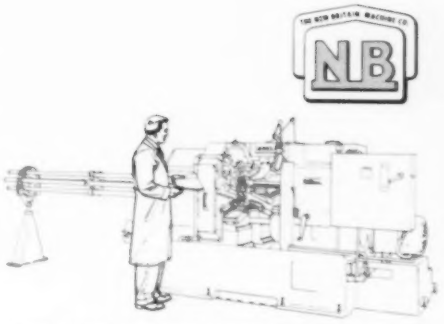
NEW BRITAIN



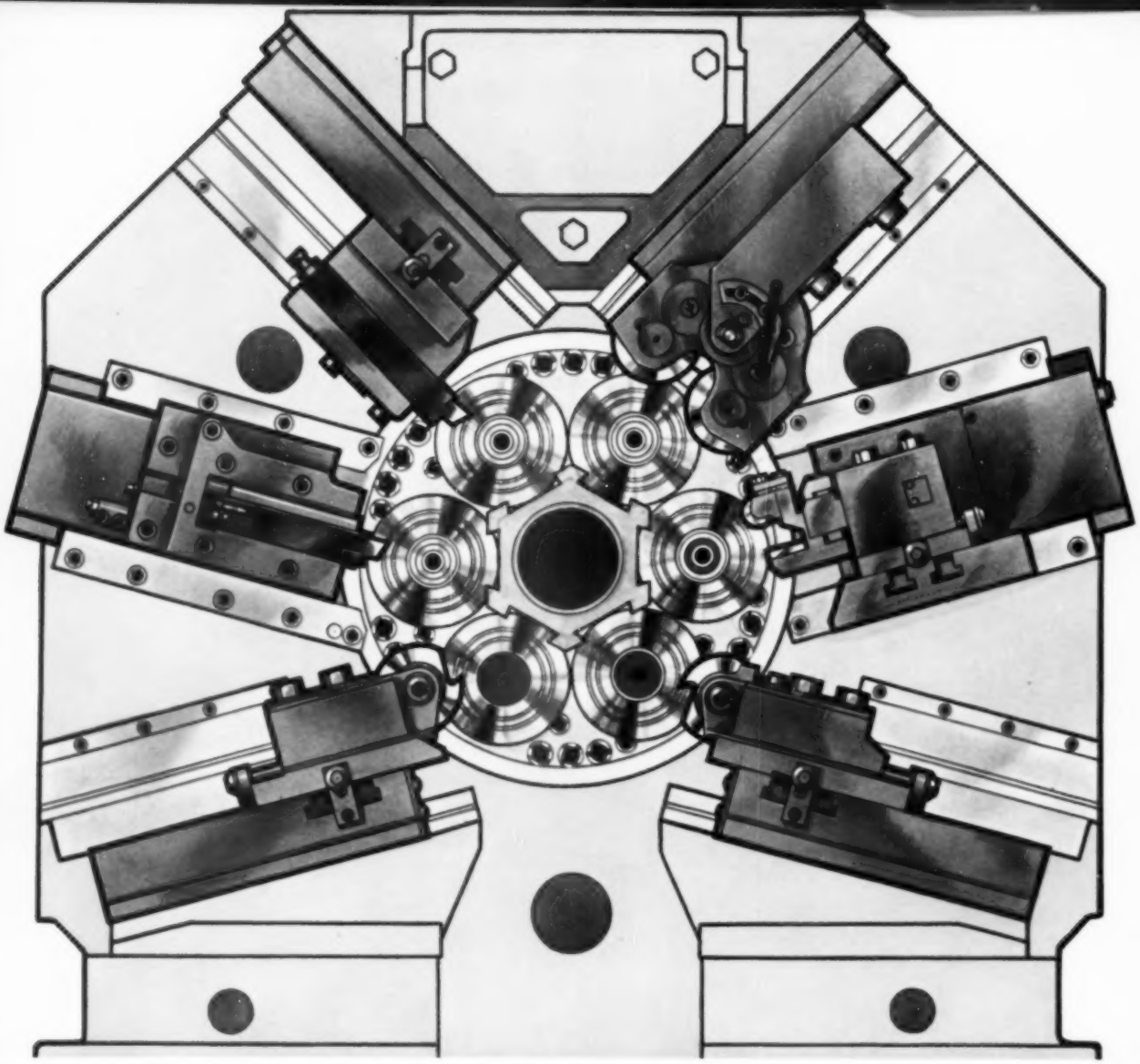
for New Britain accuracy in the 1" and 1¼" range

The new Model 52 gives you every feature of the most modern bar machine design.

Six independent radially-operated cross slides · Spindle speed range of 271-4249 r.p.m. · Spherical roller collet closing mechanism · Automatic stop · More efficient spindle spacing · Greater tooling area accessibility · Positive locating and locking of spindle carrier · Wear-preventing spindle carrier lifting mechanism. Turn the page for more information. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



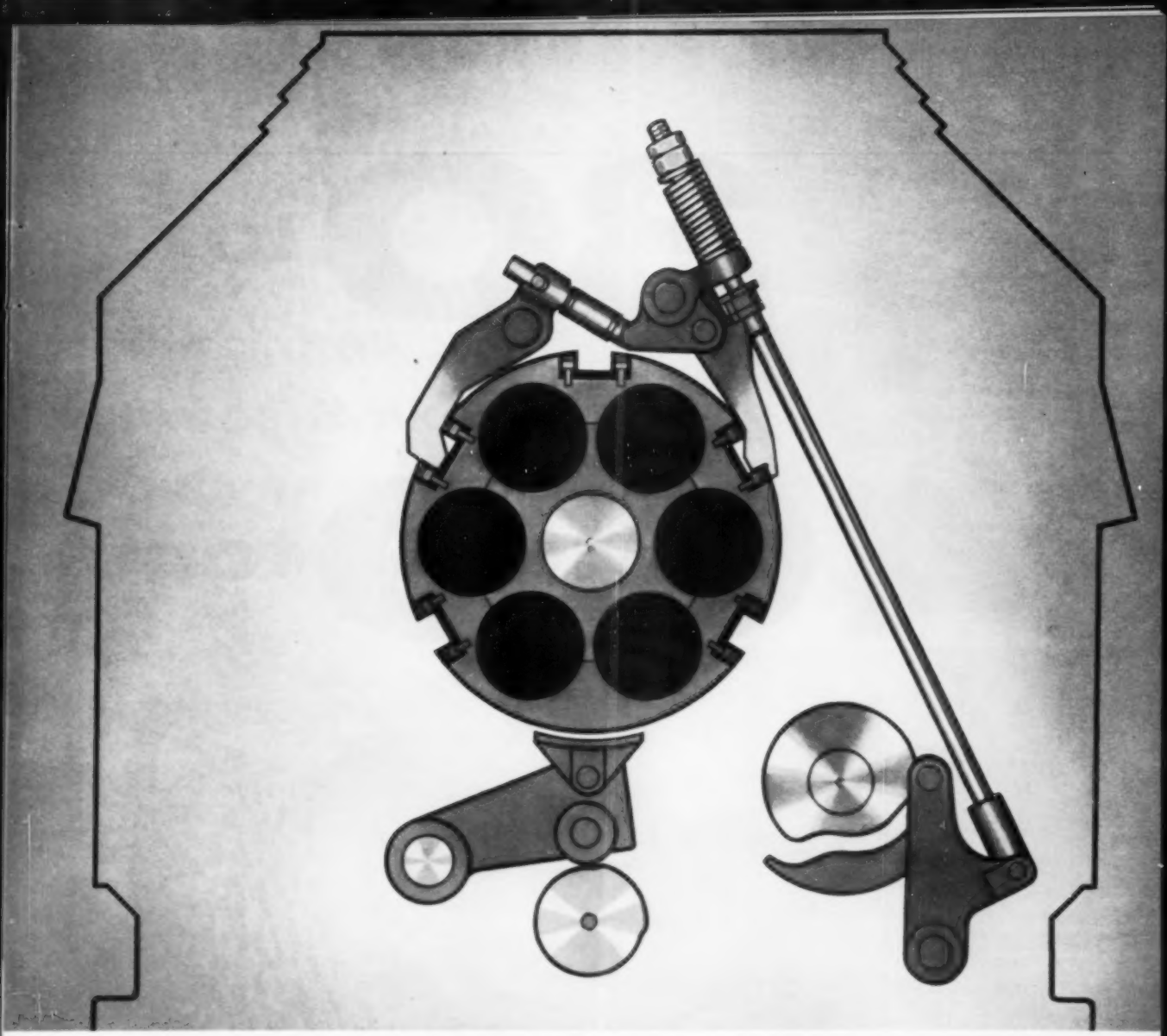
MODEL **52** NEW BRITAIN AUTOMATIC BAR MACHINE



more operations with a cross slide in every position

The New Britain 52-62 Series automatic bar machines offer you the advantages of a cross slide for every spindle, permitting practically unlimited tooling combinations. Completely independent of each other, and solidly mounted on the frame of the machine, these six cross slides permit more operations on a single machine with simpler tools and attachments. The readily accessible cross-slide cams permit more rapid change-over, too. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

MODEL **62** NEW BRITAIN AUTOMATIC BAR MACHINE
1⅝" and 2¼"



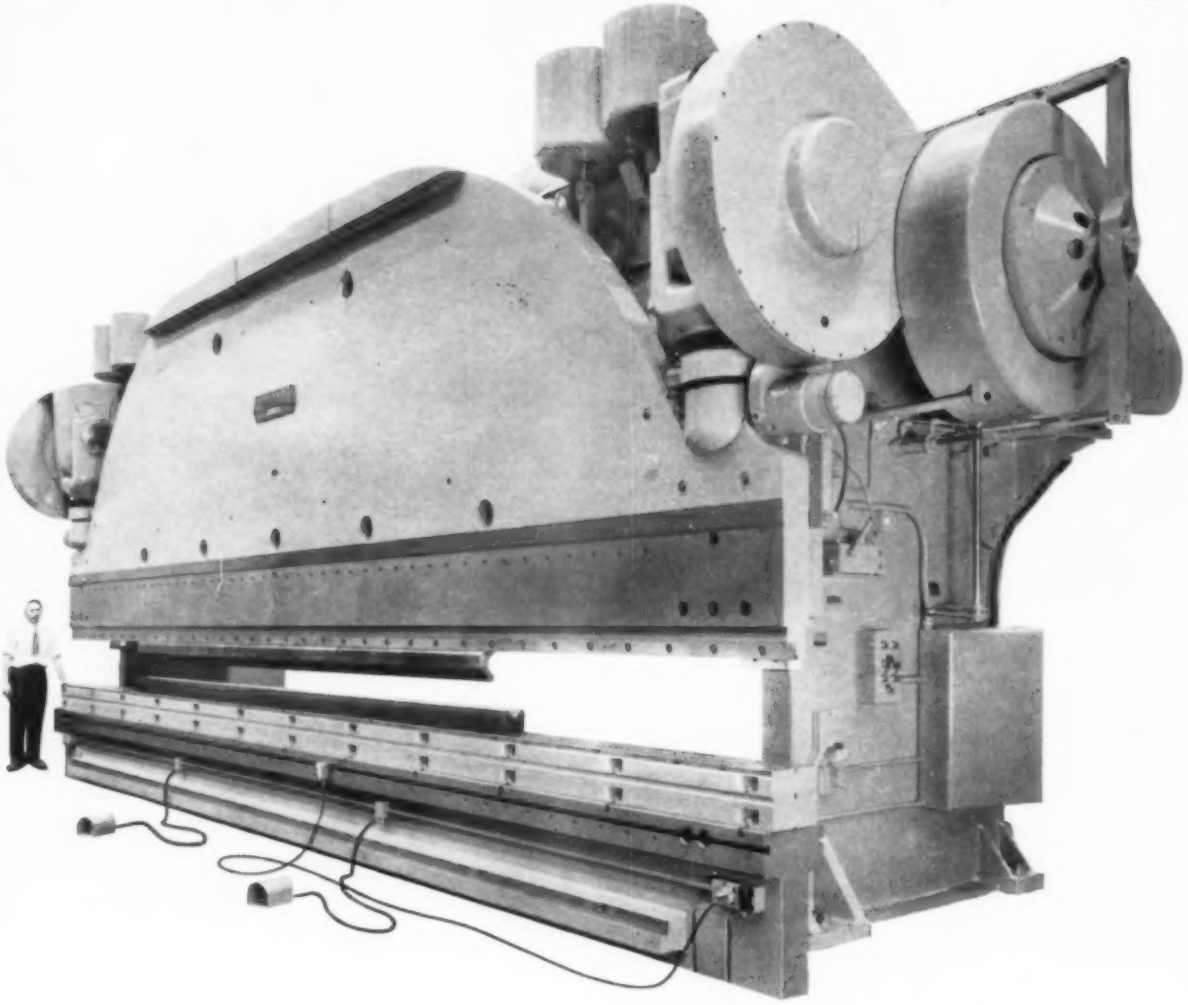
more accurate operations with positive lifting, locating and locking

Making heavy, multiple cuts with precision requires positive, accurate locating and locking of the spindle carrier. This schematic shows a New Britain spindle carrier and the simply designed, rugged mechanism which automatically lifts the carrier during index to eliminate wear, and positively locates the carrier, clamping it rigidly to the machine frame, to eliminate vibration. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

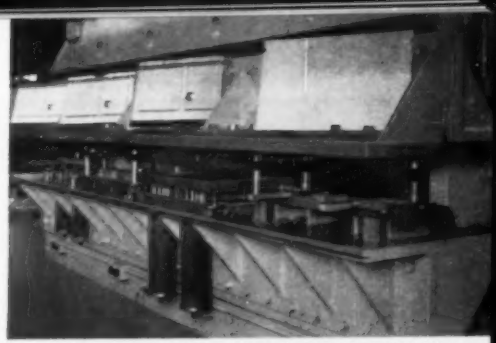
The New Britain Machine Company

New Britain-Gridley Machine Division
New Britain, Connecticut

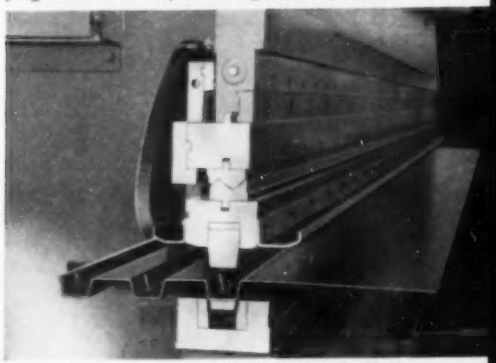
30 to 1400 tons (and up)



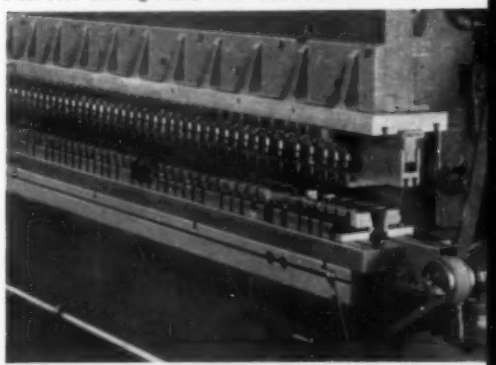
Cincinnati Press Brakes deliver maximum "earning power"



progressive die setup for refrigerator top components



steel roof decking made with "double-decker" dies



double row punching with continuous slug removal

forming corrugated culvert sections in successive hits

Alert production people are finding important new applications for Cincinnati Press Brakes—for forming, notching, punching, and multiple operations—in order to save money on existing products, or make money on new ones.

Cincinnati not only provides 15 standard machine capacities to meet your tonnage requirements, with the built-in features that insure accuracy, production, and long life. In addition, Cincinnati offers a complete tooling service:

1. Design—Our Application Engineers can help you design the proper tooling for maximum product quality and economy.

2. Manufacturing—From our large stock of die steel, our machining and assembly facilities can produce—promptly—the finished tooling you require.

3. Testing—All Cincinnati Press Brake tooling is proven by rigid tests and inspection before shipment.

We invite you to use these valuable services . . . to get more out of the press brakes you now have, or to make the most productive choice of new machines for your current and future needs.

Write Dept. A for Catalog B-5.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

Roughing and finishing this large motor shaft, a modified Standard Carboloy Tool (tipped with Grade 350) boosted the number of linear inches cut by 30% over other tools.

SETUP: Material—AISI 1045 modified (hot-rolled). **Speed** — 300 SFPM. **Feed** — 0.020 inch. **Depth of cut**—1/16 to 1/8 inch. **Coolant**—Yes.

3 reasons why industry specifies more Carboloy® braze-type tools than any other brand

1 Consistent, record-breaking performance

Tough jobs, like the one at left, are the real test of a tool's performance. And in plant after plant, Standard Carboloy Tools have proved that they deliver maximum production – at lowest cost per piece. They're made by the company that pioneered "standards." Their shanks are of the finest cold-drawn steel. Their carbide edges are automatically diamond-ground for accurate machining.

2 Complete range of styles, sizes, grades

Standard Carboloy Tools are available in thirteen styles, hundreds of sizes. Used "as is" or adapted to specials, they can handle up to 80% of all single-point jobs – from rough turning to precision threading. They're available with tips of Carboloy Extra-Performance steel-cutting grades 330, 350, and 370. Or, with carbides for cast irons, super alloys, nonferrous and nonmetallic materials.

3 Immediate delivery from local stocks

There's no waiting for "long distance" delivery when you order Standard Carboloy Tools. Authorized Distributors of Carboloy cemented carbides in 140 cities keep full stocks on hand for off-the-shelf delivery. Your local Carboloy Distributor is listed in your Yellow Pages. Call him today. Or write: *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Road, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

facts about LEDLOY* FREE-MACHINING STEELS

Inland's Special Ledloy Screw-machining Steels Outperform B1113 and in Certain Cases Brass*

There are two grades of Inland Ledloy Steels that have been developed specifically for automatic screw-machine operations, Ledloy Grade A and Ledloy Grade B.

Ledloy Grade A, the most widely used leaded steel grade, machines from 25% to 55% faster than regular free-machining steels and yet retains all the desirable characteristics. Ledloy Grade A contains .15/.35% lead—uniformly dispersed through the steel so that it has no appreciable effect on the steel except to increase its machinability to a marked degree. Ledloy Grade A retains all the properties of open hearth free-machining steel of comparable base analysis.

Whatever you have been machining from regular free-machining steels you can machine from Inland Ledloy Grade A and increase your machining time up to 55%, and at the same time, obtain a superior surface.

The place of Inland Ledloy Grade A has been so firmly established in the screw-machining industry that the A.I.S.I. and S.A.E. have adopted a new grade designation tailored to its specifications. *The new standard grade designation is* C12L14.

Inland Ledloy Grade B, the fastest machining steel produced commercially today, was developed by Inland to replace brass in the manufacture of parts where machinability is the all-important factor. Ledloy Grade B provides much greater strength than brass, yields more parts per pound and yet machines from 80 to 90% as fast as the more costly free-machining brass grades.

Ledloy Grade B, like Grade A, is an open hearth steel with all the desirable open hearth steel qualities. It is rephosphorized, resulphurized and lead treated. The only difference between the two grades is that Grade B contains a higher sulphur content. This additional sulphur increases the machinability of Grade B over Grade A about 25%.

In deciding which grade of Inland Ledloy is best for a particular part you are machining, weigh carefully the following factors: amount of machining to be done on part, type of machining, machining time per cycle, strength required in finished part and cost of material.

Where average machining is called for, you will probably find Ledloy Grade A the most practical. Where more machining operations per part are required, or where the machining is more intricate, Grade B will probably be more satisfactory. The additional cost of Grade B can be more than made up in decreased machining costs.

Whichever grade of Inland Ledloy is best for your particular machining operation, you will find that Ledloy will provide fast machining and excellent finish for the parts you make. Ledloy, because of its lower friction component and inherent lubricating characteristics, will also greatly increase the life of your cutting tools.

Many grades available—Inland Ledloy free-machining steels are available in a wide range of standard carbon and alloy grades in bar form. Ledloy free-machining plates are also produced.

If your product requires machining, it will pay you to get all the details on Inland Ledloy . . . the original leaded steels. Ask your cold-drawer about them today, or write Inland Steel Company, 30 West Monroe Street, Chicago 3, Illinois, for the interesting booklet, "Properties of Inland Ledloy Steels."

INLAND STEEL

Sales Offices: Chicago · Milwaukee · St. Paul · Davenport
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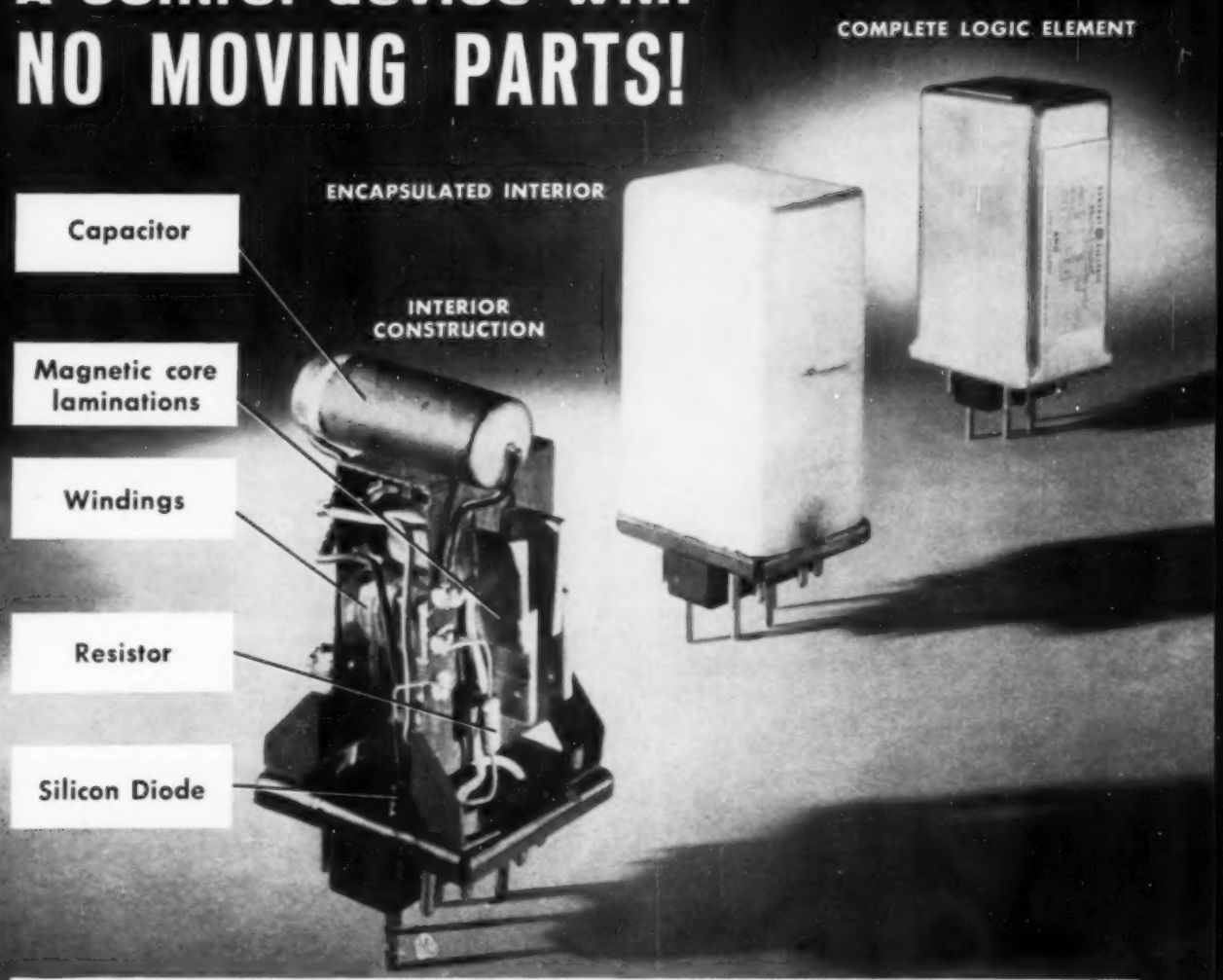
INLAND

Ledloy Steels
the world's most machinable

*Reg. Trade Mark

A control device with NO MOVING PARTS!



General Electric static control: easy to apply, virtually maintenance free

Here's a control device which functions as a relay—but without moving parts or contacts to service and replace. It's a General Electric static control element. Its life is practically limitless, because length of life is *independent of the number of operations performed.* Maintenance costs and possible shutdown because of relay failure are virtually eliminated.

The General Electric logic element is the heart of a static control panel. It performs the same function that a relay does in a conventional circuit—but more efficiently, more dependably. To apply just express the machine operations in logic functions and apply the proper static control logic elements.

A major automotive manufacturer has designed several panels using G-E static control components. The electrical supervisor of their manufacturing development section says: "G-E components make planning static control relatively simple, and they're practically fail-proof. One machine, where maintenance could be a real problem, was equipped with a static control panel about 12 months ago. To date, there hasn't been an electrical control failure of any kind. We've already converted three machines to static control, and have immediate plans to convert several more."

Want more information on what static control with General Electric components can do for you? Simply call your G-E Apparatus Sales Office, or write Section 733-43, Schenectady, N. Y., for Bulletin GEA-6578. *General Purpose Control Dept., Bloomington, Ill.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Willis Ehrhardt tells how Moore Jig Borers and Jig Grinders built nation-wide service

This is another in a series featuring the views of owners of leading contract tool and die companies

by **WILLIS G. EHRHARDT**
Managing Partner
Ehrhardt Tool & Machine Company
St. Louis, Mo.
Specialist in High-Precision
Gages and Dies

"'*A nation-wide service for the few who want the most in precision dies, tools and gages.*' That's what we claim; that's what we do. And the backbone of the facilities which enable us to provide this service, is our Moore Jig Grinding and Jig Boring equipment.

"We were the first contract tool and die company in our area to install these versatile machine tools years ago, and we've added the new models promptly. In addition to helping us maintain the highest precision standards, their very flexibility of application brings in a caliber of work which is often beyond the scope of toolrooms and of competition.

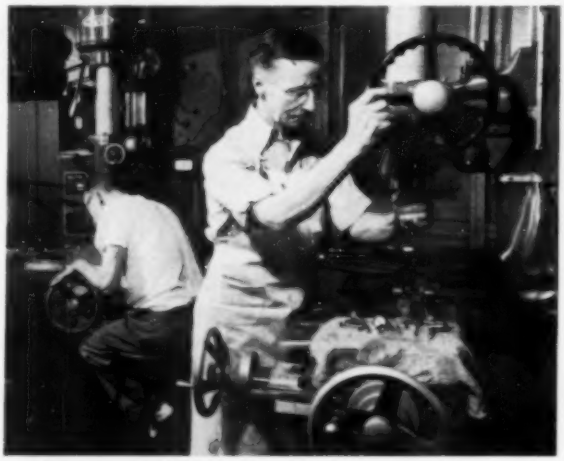
"We are quite proud, for example, of an *all-ground die*, machined entirely on the Moore Jig Grinder, *in hours*. Formerly, we could not have tackled its complex contours and holes. Equally intricate operations have been performed by our Moore Jig Borers.

"Beyond a doubt, the speed, ease of operation and high-precision of our Moore equipment for holes, contours and surfaces are prime factors in keeping us 'first on the Mississippi'."

Can Moore equipment cut costs in *your* toolroom? Moore shows you the way—with literature describing the features of these machines and how they can be used to your profit. For copies, just write...

MOORE SPECIAL TOOL COMPANY, INC.
738 Union Avenue, Bridgeport 7, Connecticut

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts the modern way. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.



"MOORE JIG BORERS have proved a profitable investment from their first day of use. They've enabled us to spot, drill, ream and bore, at higher precisions, and faster, than any previous equipment. Carbide die work seems to be their 'cup of tea'."

"OUR MOORE JIG GRINDER has established a record of trouble-free performance absolutely unmatched... especially remarkable in view of the many 'trick' operations it is called upon to handle."

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

Without SCREW THREADS not one of these products for modern living would be possible. And, only *taps* generate internal screw threads with the speed and precision demanded by modern production methods.

But, today your precision tapping jobs cannot be entrusted to *just any tap.* Your taps must be backed by precision engineering, precision measuring tools and time earned know-how. There is a big difference in using *just any taps* and using TAPS by GREENFIELD.

GREENFIELD TAP and DIE CORP.
GREENFIELD, MASS.

New ARMSTRONG

Armide CARBIDE INSERT TOOL HOLDERS

STYLE TR
(opposite Hand TL)
Holds Triangular 6-edge, Armide and other carbide "throw-away" inserts.

STYLE SR
(opposite Hand SL)
Holds square, 8-edge, Armide and other carbide "throw-away" inserts.

Buy **ARMSTRONG** TOOLS from your Industrial Distributor

Write for catalog

Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD**—speeds indexing of Inserts.
- **REPLACEABLE SEAT** of Hardened Tool Steel—protects shank and provides flat base to prevent damage to inserts as they are clamped in position.
- **SHANK** of Heat Treated Alloy Steel—gives extra strength and rigidity.

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

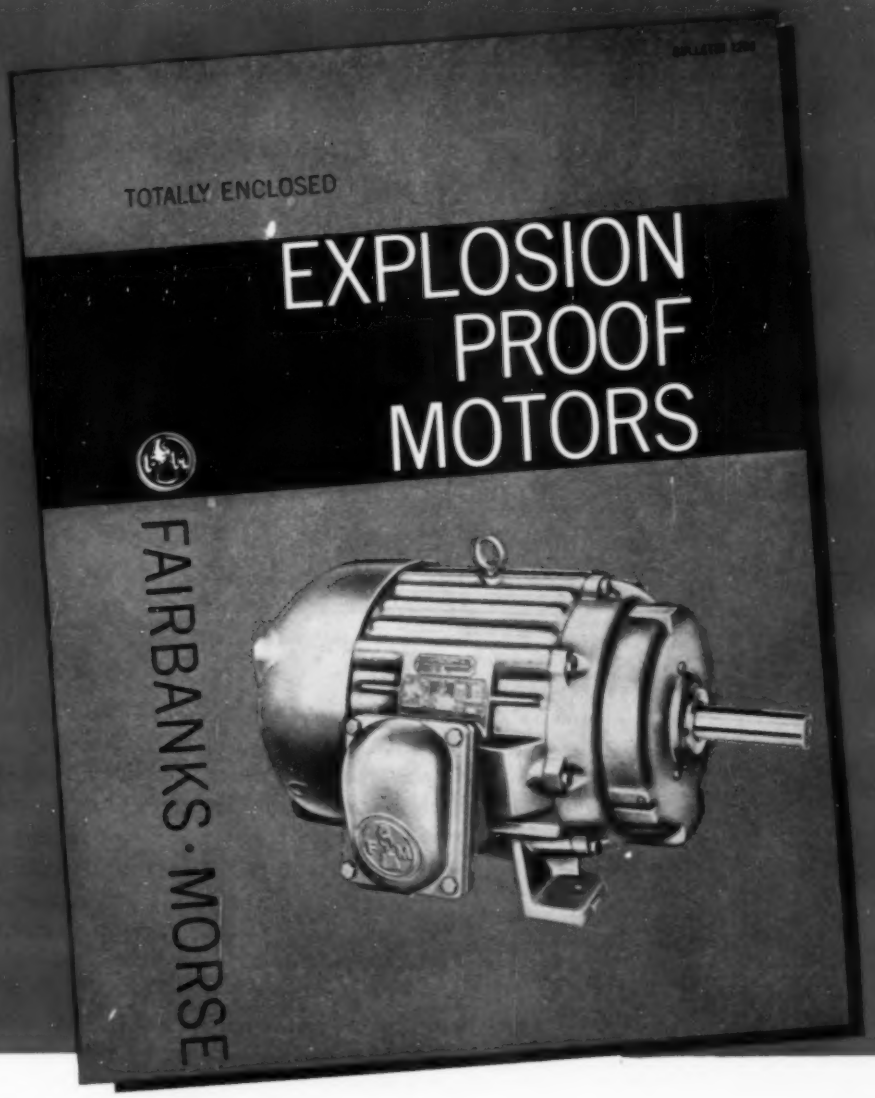
ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

NEWEST MOTOR TO CARRY UNDERWRITERS' LABEL



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All new inside and out—new, rugged frame design . . . for new, improved performance in all Class I, Group D, and Class II, Group E, F and G hazardous locations.

Get full information . . . send for Bulletin 1200 on new Fairbanks-Morse line of totally enclosed, explosion-proof motors. Write today: Fairbanks, Morse & Co., Dept. AM-3-24, Chicago 5, Ill.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MAGNETOS

Here's a MARVEL HIGH-SPEED-EDGE Hack Saw Blade we would'nt sell you!

This blade **could** have been packaged and shipped as a genuine MARVEL High-Speed-Edge Blade . . . and it **might** have performed to a customer's satisfaction. Instead, it was rejected and will be scrapped because inspection revealed a minute imperfection.

There's nothing unusual about this. Certainly, other hack saw blade manufacturers inspect their products, and undoubtedly reject blades for one reason or other, because they are trying to market the best blades they know how to make.

And that's the point—here at MARVEL, where the composite blade was invented and perfected over 30 years ago, we believe we know more about making high-speed-edge hack saw blades than any other maker. We've been at it longer, and the unequalled performance of MARVEL Blades on every kind of material is evidence that we're right.

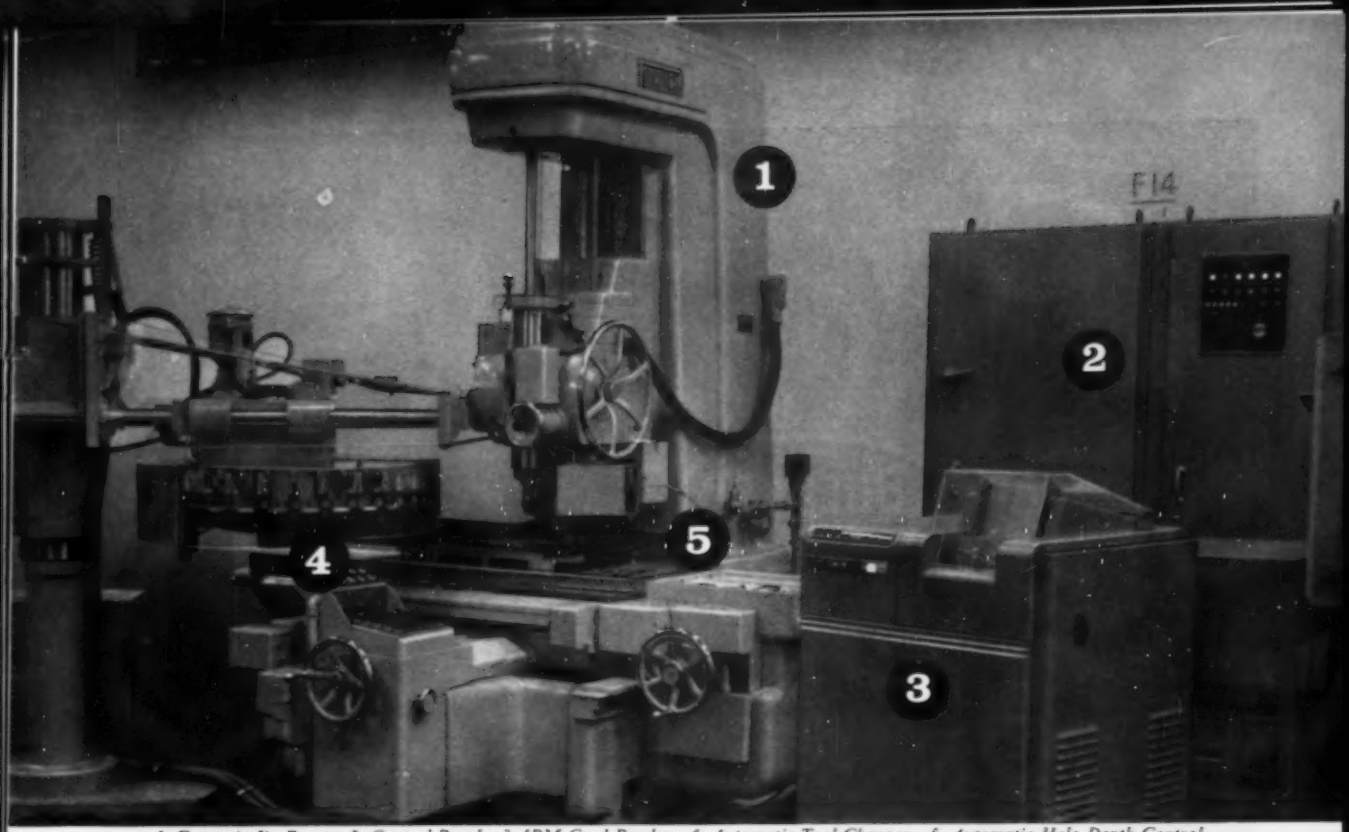
Use MARVEL Blades on your power hack saws with perfect confidence that they have no equal. You can get MARVEL Blades at your nearby Industrial Distributor.

Write for the new MARVEL Cutting Tool Bulletin.

B-1122

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE. · CHICAGO 39



1. Fosmatic Jig Borer 2. Control Panel 3. IBM Card Reader 4. Automatic Tool Changer 5. Automatic Hole Depth Control

World's first totally automatic jig borer--by Fosdick

Now, any jig boring operation can be completely programmed and controlled by punched cards and tapes. This total automation is available only on the Fosmatic Jig Borer, developed by Fosdick and the International Business Machines Corp.

HERE'S HOW IT WORKS: Once workpiece is loaded on the jig borer, the following functions are controlled completely automatically —

Table and saddle locations
Spindle feeds and speeds
Feed depth
Spindle head height
Automatic tool changing

Dimensions, feeds, speeds, etc. are charted by your Production Engineering Department, then tape or cards are punched (a simple clerical procedure). Optimum programming can be achieved by using an automatic computer to establish the best possible sequence of operations. Hole size and location are accurate to ±.0001″, hole depth within .002″.

SELECT THE DEGREE OF BORING AUTOMATION YOU NEED. The above numerically controlled functions are available individually or as a group. By controlling table and saddle location only, your engineers can establish optimum work sequence (eliminates leaving decisions to the operator). By adding the other numerically controlled functions, you further eliminate errors and lost time. On single piece jobs, as well as precision production runs the result is lower cost per piece, considerable savings in set-up time and inventory, greater flexibility in scheduling. Often, jigs and fixtures are eliminated, with their high cost and lead time.

A meeting with your Fosdick representative will help you quickly determine just how these dramatic new methods can best serve your production needs. Write for Bulletin NC-A.

Need boring equipment? Get a proposal from Fosdick!

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

1st Choice

For Versatility and Adaptability

BULLARD Hydra-Feed Lathes

Rough forging of front axle spindle SAE #1037 Steel, Brinell Hardness 31-32 on the C scale.

The Senior Engineer at one of the leading motor car manufacturers in Detroit, was looking for a tracer lathe that went beyond his immediate requirement and offered easy conversion to other uses in years to come, to give longest tool life, to do the job with a minimum of shutdown time, to handle future developments in the realm of cutting tools, to reduce scrap to a minimum.

The answer to this multiple problem, according to the Senior Engineer was "BULLARD HYDRA-FEED TRACER LATHES."

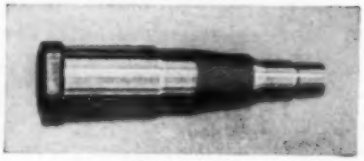
We invite you to investigate the advantages which Bullard Hydra-Feed Lathes, either tracer or multiple tool models, offer you. Phone or write your nearest Bullard Sales Office, Distributor or

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

Rough turning with Rear Tracer Slide.

Finish turning with Right-Hand Top Tracer Slide



Finished piece complete cycle time — 65 seconds.

NOW—get the features of larger machine tools costing several times as much

with the New, Improved, Low-Cost

W-T WALKER-TURNER

RADIAL DRILL PRESS

The W-T Radial Drill is made in 24 models with your choice of 4¼" or 6" spindle travel.

Nothing on the market touches it in price or dollar value

Because the drill head moves to the work, this new W-T "Light-Heavyweight" offers unusual versatility and flexibility—provides a fast, efficient means for drilling a number of holes in heavy or bulky pieces, with a minimum of set-up time.

The ram has a big 18" travel radius which allows drilling to the center of a 62" circle; the head, ram and cradle swivel 360° around the column for drilling anywhere on the table or for drilling large pieces that must be kept on the floor; the head tilts and securely locks 45° right or left; and the built-in ball bearing jack shaft assembly provides 15 speeds from 160 to 8300 rpm.

A demonstration will prove to you why this new Walker-Turner Radial Drill is better than ever before.

USE WALKER-TURNER RADIAL DRILL HEADS, with or without jack shaft assemblies, for flexible automation set-ups and other special applications.

Ask your W-T distributor to show you the many outstanding advantages of this new line of "Light-Heavyweights." He's listed under "Tools" in your telephone directory.

MAIL COUPON FOR COMPLETE DETAILS!

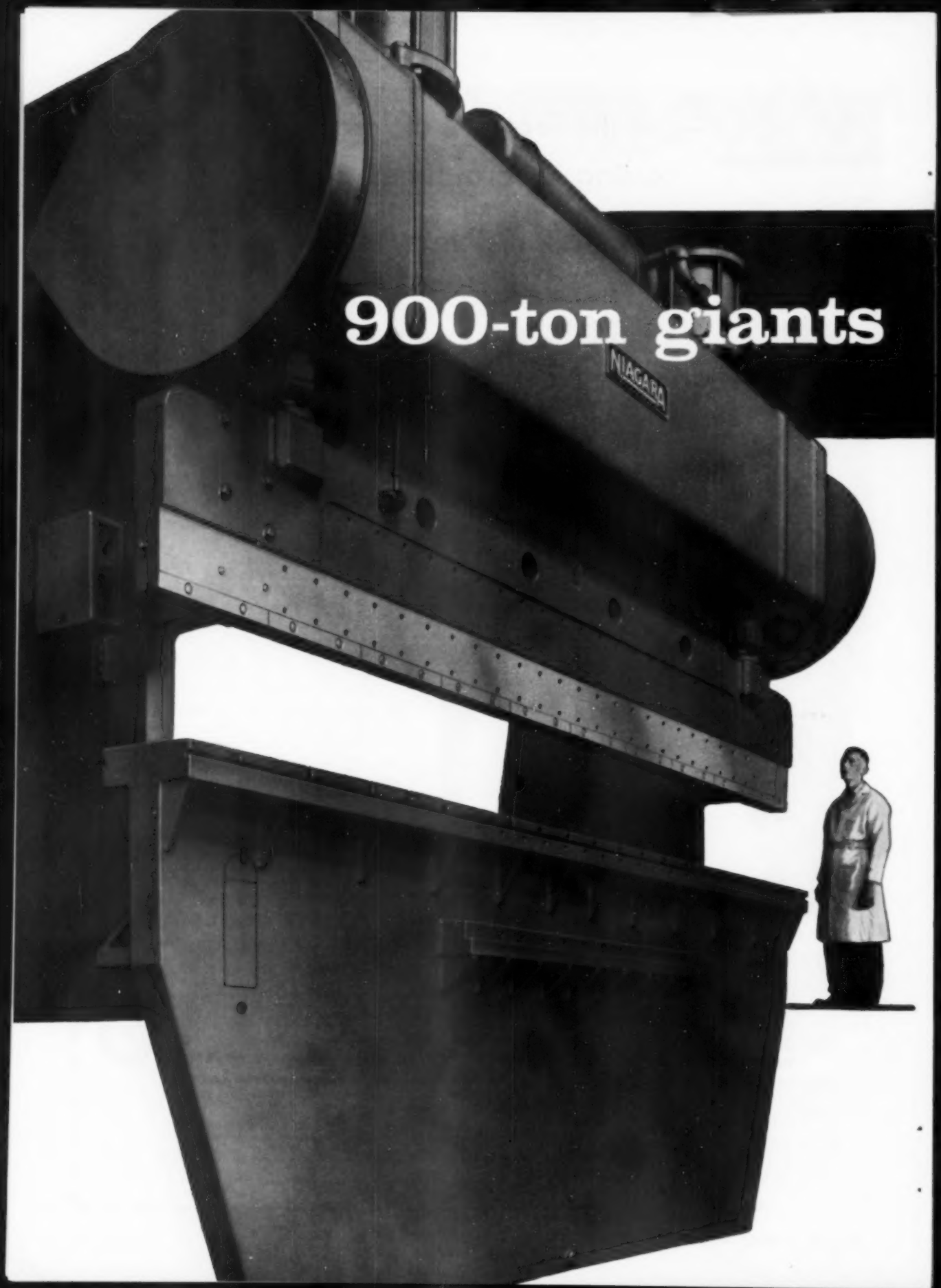
WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WC21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send name of my Walker-Turner Distributor.
☐ Please send new, complete catalog on Walker-Turner Radial Drills.

Name_____

Address_____

City_____ Zone_____ State_____


900-ton giants
NIAGARA

to 15-ton work-horses

AMERICA'S MOST MODERN LINE OF PRESS BRAKES OFFERS YOU THE MOST

Take your pick! 76 standard models! Niagara offers you any press brake you need . . . and the most modern features in whichever one you choose. Like its complete, companion line of power squaring shears, the Niagara line of press brakes is America's most advanced in engineering and performance.

Collectively, Niagara Press Brakes embody an unequalled array of features to boost production, simplify operation, improve quality and cut costs:

- **Power clutch** — electro pneumatic friction, low inertia, no adjustments needed.
- **Power brake** — spring applied, air released, synchronized with clutch.
- **Power treadle** — new ease of command, no operator fatigue.
- **Ram micro-jogs smoothly, softly** to a layout line — even through work at full capacity . . . stops on a dime.
- **Press type electric controls** — for greater safety.
- **Wrap around crown** — modern, clean sweep styling.
- **Adjustable clutch torque capacity** controlled by varying air pressure to protect machine and dies against overload.
- **Heat treated and hardened steel gearing** operate in bath of oil — no open gearing.
- **Laminated non-metallic ways** — minimize wear, prevent scoring.
- **Anti-friction bearings** throughout intermediate and high speed shafts.
- **Front operated adjustable speed drives** and two-speed transmissions.
- **New, heavy duty, front operated back gages** — power or manual.
- **Self-locking power ram adjustment** with positive stops against overtravel. Direct reading counter type indicators.
- **Heat treated alloy adjusting screws** with ball joints and replaceable seats.
- **Centralized pressure lubrication** delivers oil to all main bearings, connection bearings and gibs.

Make a complete check of all the Niagara features that pay big dividends in press brake performance. Write for illustrated Bulletins 89 and 90 containing complete details and specifications on this great line of press brakes (bending capacities from 16 ga. to 1" and bed lengths from 4' to 30').

NIAGARA press brakes

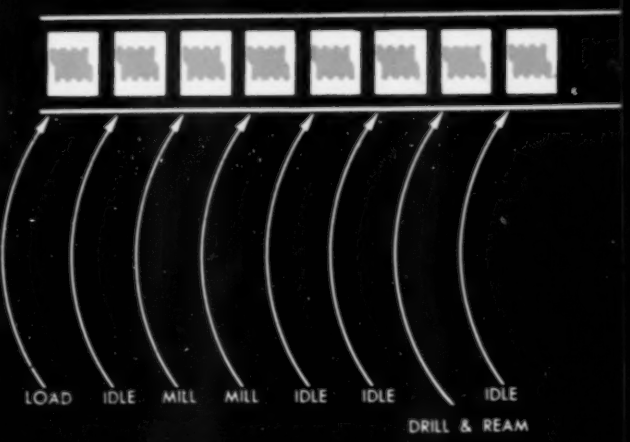
NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N.Y.

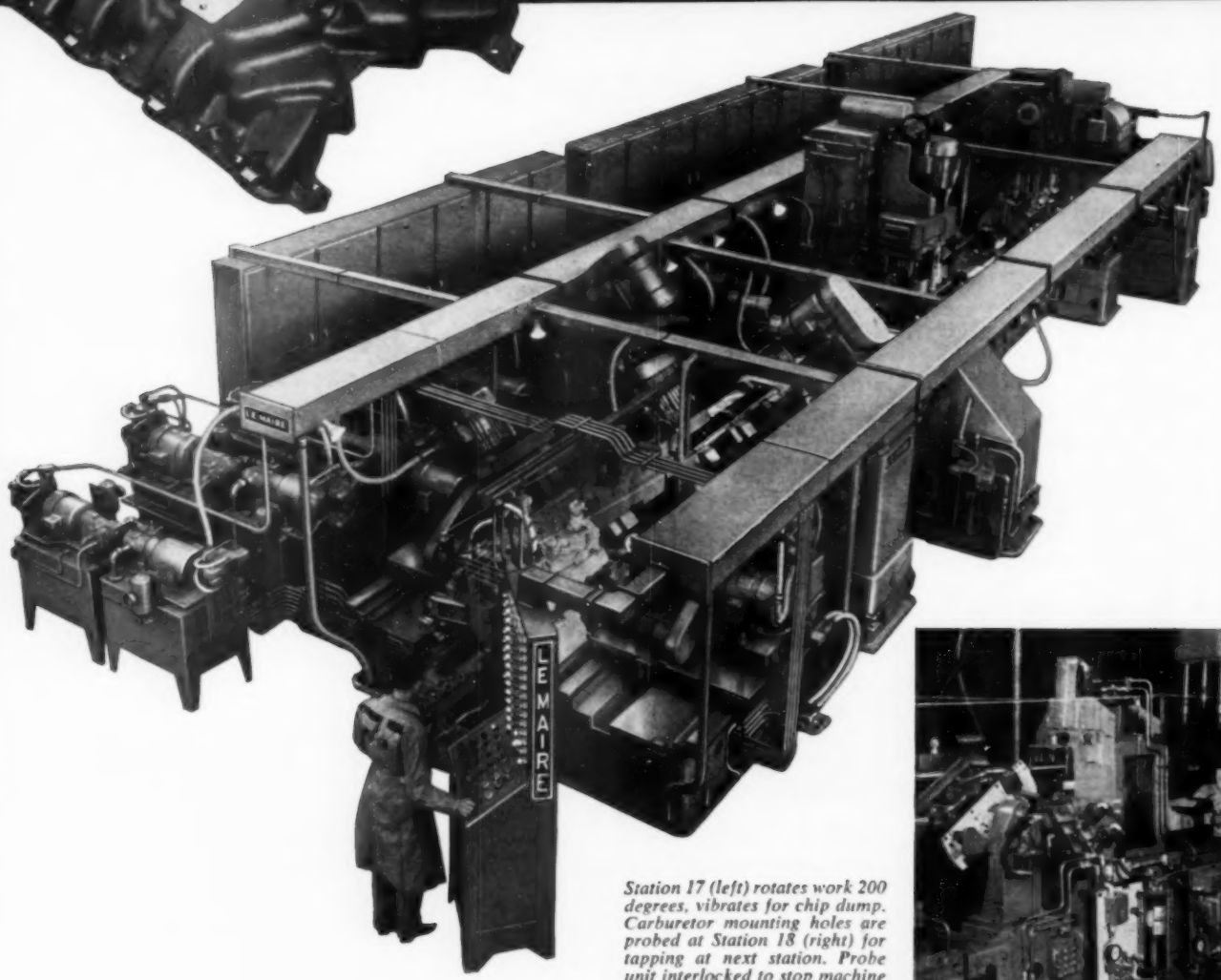
DISTRICT OFFICES: Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

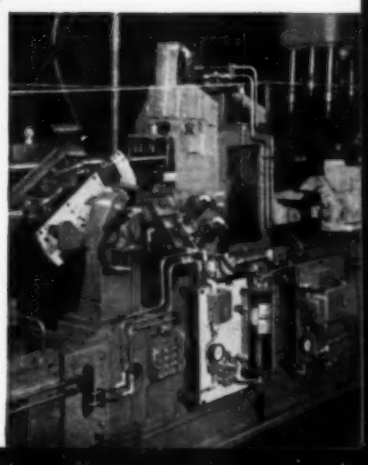
Distributors in principal U. S. cities and major foreign countries

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

PRODUCING

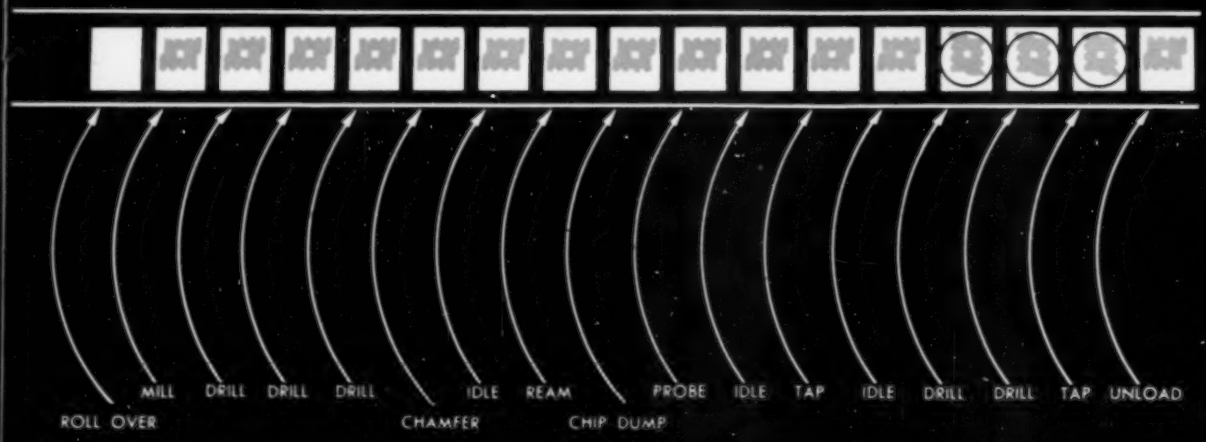






Station 17 (left) rotates work 200 degrees, vibrates for chip dump. Carburetor mounting holes are probed at Station 18 (right) for tapping at next station. Probe unit interlocked to stop machine if any hole is not drilled to correct depth.

with LE MAIRE



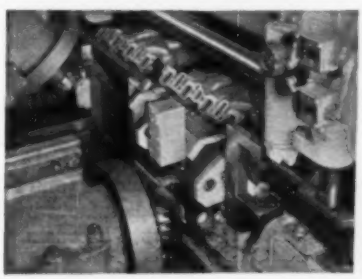
Truck Manifolds Completely Machined, Re-positioned 5 Times, in 55 Seconds

This 25-station LeMaire "Producer" completely machines three different styles of truck engine manifold castings. The machine is built for transfer-through operation and features automatic loading and clamping at each station. The part is re-positioned five times while in process during the 55-second machining cycle, including one 180 degree roll-over, one rotation for vibratory chip removal, indexing for a probing operation, one 90 degree index and re-index.

Features include: Unitized "building block" construction, with provision made for future changes—lighting at every work station—complete electrical interlock and individual selector switches and controls at each work station—"PresTest" lights on main control console—automatic selective lubrication of fixtures and ways—lights indicating "Automatic" or "Manual" control for safety during setups — electrical and hydraulic systems to J.I.C. — 189 hp electrical system—hardened and ground wear surfaces.

Here is another successful *producing* installation, designed, manufactured and tooled by LeMaire. Tell us about *your* next production machining problem.

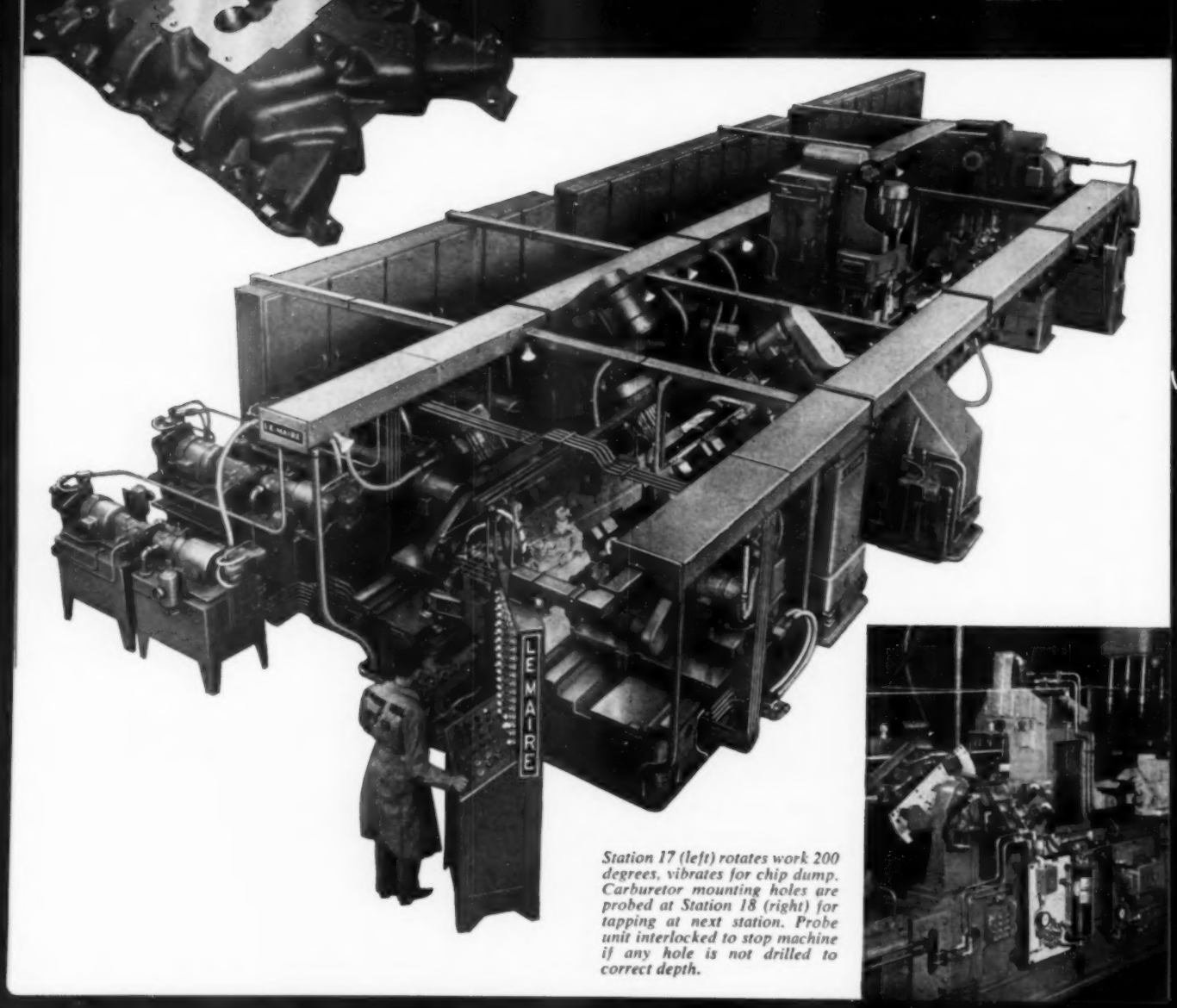
Manifold mounting holes are drilled and one hole is reamed for precision location in following operations at Station 7.



Locating faces for subsequent operations milled on both sides of work at Station 3. Cutters at Station 4 mill both manifold faces, are retracted by cross slide after stroke to minimize wear.

Inserted blade cutter mills carburetor mounting pad at Station 10.

LE MAIRE MACHINE TOOL COMPANY
2857 S. TELEGRAPH ROAD
DEARBORN, MICHIGAN
Designers and Builders of
Special High-Production Machines



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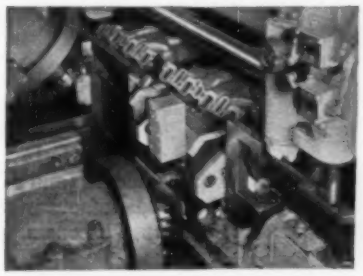

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LE MAIRE MACHINE TOOL COMPANY
2657 S. TELEGRAPH ROAD
DEARBORN, MICHIGAN
Designers and Builders of Special High-Production Machines

Precision Tool News

B·S

No. 5 REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER

Announcing New B & S Dial Bore & Dial Snap Gage Lines

Brown & Sharpe Dial Bore Gages quickly determine to .0001" whether bore diameters are within tolerance . . . disclose bell-mouth, out-of-round, barrel-shaped and other bore conditions. Frictionless action provides high repetitive readings.

Seven sizes cover from ⅛" to 13", with no spacers or shims required. Fixed-pin equalizers assure positive

DROTT 4-IN-1 SKID SHOVEL built lighter and stronger with USS "T-1" Steel. Can be used as a bulldozer, bull-clam shovel, clamshell or skid shovel. Can load trucks or freight cars.

"T-1" Steel reduces weight of 4-in-1 bucket by 35%, boosts payload by 1,200 pounds

"Our engineers specified USS 'T-1' heat treated alloy steel in the construction of our 4-in-1 skid shovel bucket because we could reduce the original weight by 35%. What's more, we could add one-half yard to the bucket capacity," says Mr. Edward Drott, President and Chief Engineer, Drott Manufacturing Corporation, Wausau, Wisconsin.

The entire Drott bucket is fabricated from USS "T-1"* Steel which has a minimum yield strength of 90,000 psi, nearly 3 times that of structural carbon steel. This strength helped to make the weight reduction possible . . . and the reduced weight on the front end of the tractor improved the balance and increased efficiency.

50% longer wear. Drott buckets made of "T-1" Steel have now been in rugged service about two years. Because of "T-1" Steel's high resistance to impact abrasion, the buckets will last 50% longer than those made of lower strength steel.

Strength after welding. USS "T-1" Steel was found to retain its strength after being welded or flame cut. This was an important factor in design.

Sub-zero toughness. Even at 50° below zero, USS "T-1" Steel retains its high resistance to shocks and jolts in rugged work.

Build better with USS "T-1" Steel. No other steel possesses the remarkable combination of high yield strength, toughness and weldability found in "T-1" Steel. It may be the answer to your problems for many different types of mining and construction equipment. *Remember that we also make* USS COR-TEN*, USS TRI-TEN* *and* USS MAN-TEN* *high strength steels . . . standards for heavy-duty equipment.* United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

**Registered trademarks.*

USS United States Steel

Precision Tool News

No. 5 B·S REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER

"Ready Mark" Flat Stock is Pre-Colored for Immediate Layout

Brown & Sharpe now offers a complete line of "Ready Mark" precision ground tool steel that comes to you coated with a smooth blue finish, all ready for scribing. The blue finish prevents rust, eliminating the need for "greased" stock; serves as permanent identification. This pre-colored stock saves about 5-minutes degreasing, bluing and drying time each time it is used.

The stock itself is the same free-machining, easy and full-hardening quality steel that is used for regular B&S Oil Hardening Precision Ground Flat Stock, preferred the world over. All pieces are 18" long, conveniently packaged in easily-identified envelopes (smaller sizes) or cartons . . . with complete heat-treating instructions and analysis.

B&S Direct Reading Micrometer Speeds Measurements

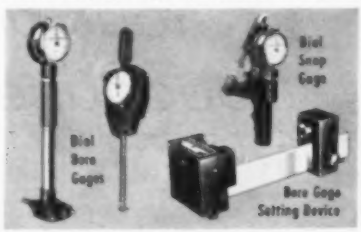
Numbers appearing in plastic windows on the revolving thimble of Brown & Sharpe's new D. R. M. 200 micrometer shorten reading time by indicating .001ths directly in units of .005ths. Individual .001ths and .0005ths are then read easily from the thimble—.0001ths from widely-spaced Vernier graduations on the non-revolving sleeve. There is no possibility of "twenty-five thousandths" errors.

Announcing New B & S Dial Bore & Dial Snap Gage Lines

Brown & Sharpe Dial Bore Gages quickly determine to .0001" whether bore diameters are within tolerance . . . disclose bell-mouth, out-of-round, barrel-shaped and other bore conditions. Frictionless action provides high repetitive readings.

Seven sizes cover from ⅛" to 13", with no spacers or shims required. Fixed-pin equalizers assure positive centralizing in hole; handles are insulated against hand heat; and an easy-reading AGD indicator with adjustable bezel provides consistent accuracy. Available with tool-steel points in carrying case. Carbide or diamond points available.

Easy-to-use B&S Bore Gage Setting Devices are perfect companions that simplify setting of the Dial Bore Gages . . . eliminate the need for inventories of ring gages. B&S Dial Snap Gages, offering similar advantages of speed and accuracy for checking outside diameters of 0" to 4", are also available.



Ask Your B&S Distributor to show you these tools

Brown & Sharpe precision tools are available to you quickly, at factory prices, through your nearby B&S Distributor. Call on him for experienced help in any of your precision tool needs. Brown & Sharpe Mfg. Co., Providence 1, R. I.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe B·S

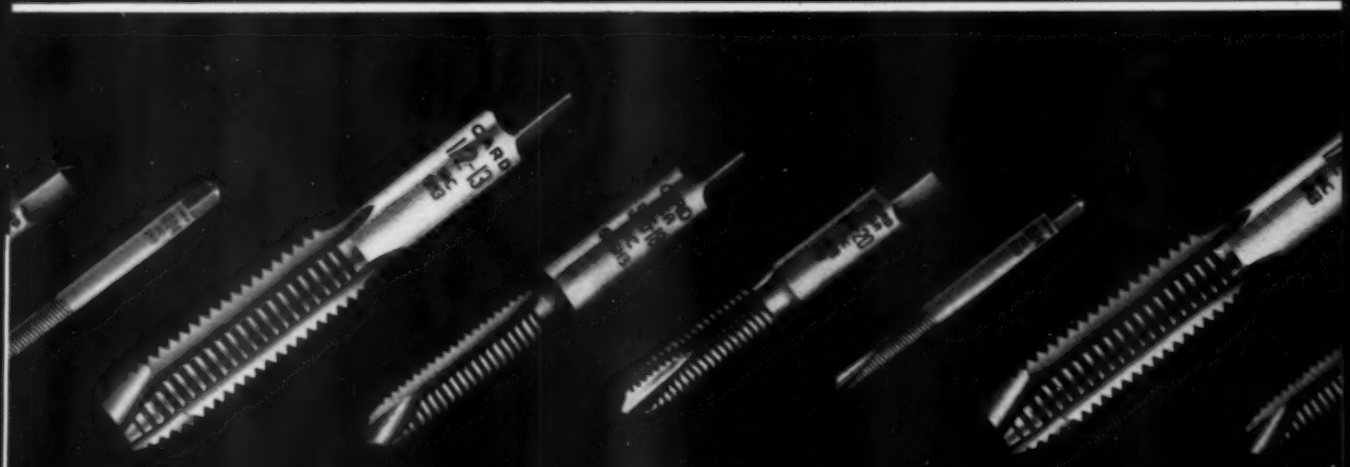
'58 BOOTH 824

PRECISION TOOLS AND GAGES • MILLING, GRINDING AND SCREW MACHINES • CUTTERS • MACHINE TOOL ACCESSORIES • GEAR, VANE AND CENTRIFUGAL PUMPS

If you use carbide tools as steadily

This brand cuts down your carbide

As these desk phones are uniform



... So Card spiral pointed taps are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production performance is the cutting tool itself. Because Card spiral pointed taps are identical they keep production up to par — and predictable. Shopmen know about the uniformity of Card taps. Card gages are like that, too.
S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

The CARD Quality

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

If you use carbide tools as steadily as machine tools use coolants . . .

This brand cuts down your carbide tool usage, production time and costs!

The more you use carbide tools the more you need Union

Wherever your production calls for cutting with carbide tools, use Union carbide tools. They perform better . . . last longer . . . lower your costs per piece produced. Union also manufactures drills, milling cutters, gear cutters, end mills, reamers, hobs and inserted blade cutters. **Available nationally through Union Distributors** and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

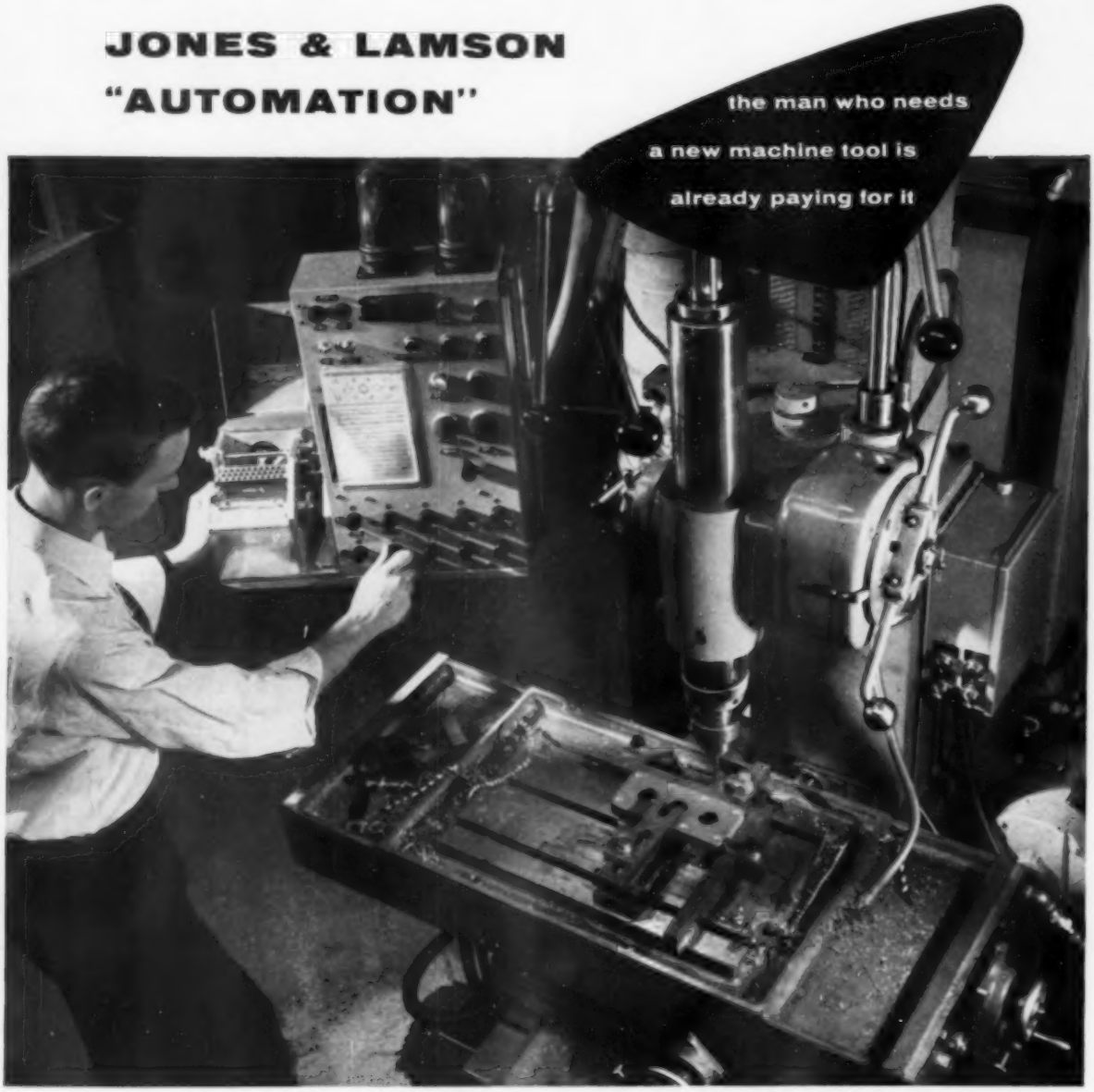
UNION

TWIST DRILL COMPANY, Athol, Massachusetts

S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

JONES & LAMSON "AUTOMATION"



This tape-controlled table eliminates set-up time on small lots

It's natural enough, in a way, to associate "automation" with huge plants and their long, high-speed production lines.

We should also keep in mind, however, that certain "automation" techniques offer tremendous benefits to the *small job shop*. Jones & Lamson research and development have produced remarkable results in applying "automation" to small-lot production.

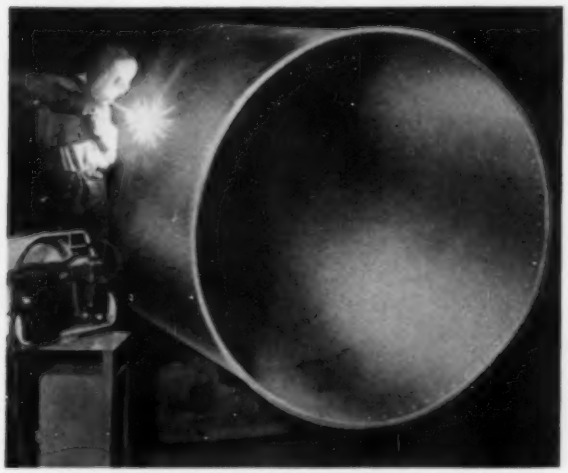
Are you interested in drastically cutting set-up and change-over time, and greatly increasing your small-lot flexibility? We'd be pleased to show you how the results of our intensive research and development programs can be put to good use in *your* operations.

Write for literature. JONES & LAMSON MACHINE COMPANY, 502 Clinton Street, Springfield, Vermont.

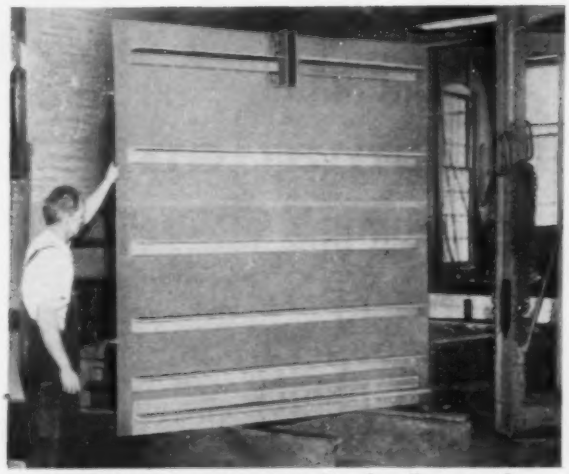
Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CUT CORROSION LOSSES

Get unusual corrosion resistance, plus high strength, toughness, weldability, and easy fabrication with Everdur,® Anaconda copper-silicon alloys

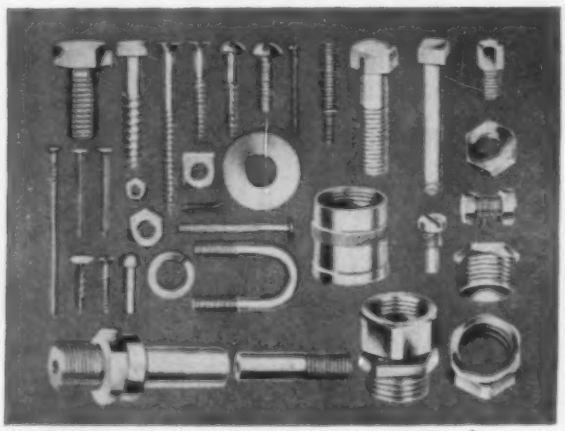


TANKS AND INDUSTRIAL EQUIPMENT requiring a combination of high strength, toughness and resistance to corrosion. Hot water storage heaters and tanks, unfired pressure vessels of Everdur are readily fabricated by welding.



IN WATER AND WASTE SYSTEMS, Everdur alloys provide easy fabrication and long service in a wide variety of jobs—from gates on to bolts and nuts. Their high strength makes possible lightweight, built-up assemblies of wrought metal.

ELECTRICAL CONDUIT of Everdur protects electric lines in corrosive environments, withstands vibration and abrasion—at oil refineries, in underwater tunnels (above), chemical plants. Made in two wall thicknesses—R.C. and E.M.T.



FASTENINGS AND SCREW MACHINE PARTS. Everdur is available in forms for hot heading and forging of bolts and accessories, severe cold-working operations for bolts and screws—and as free-cutting rod for screw machine products.

Whenever you have a tough problem calling for high strength with immunity to rust, and corrosion resistance equivalent to pure copper, consider an Everdur alloy. It may save you a lot of trouble and money. For details on properties and applications of Everdur alloys, write for Publication E-5. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5644

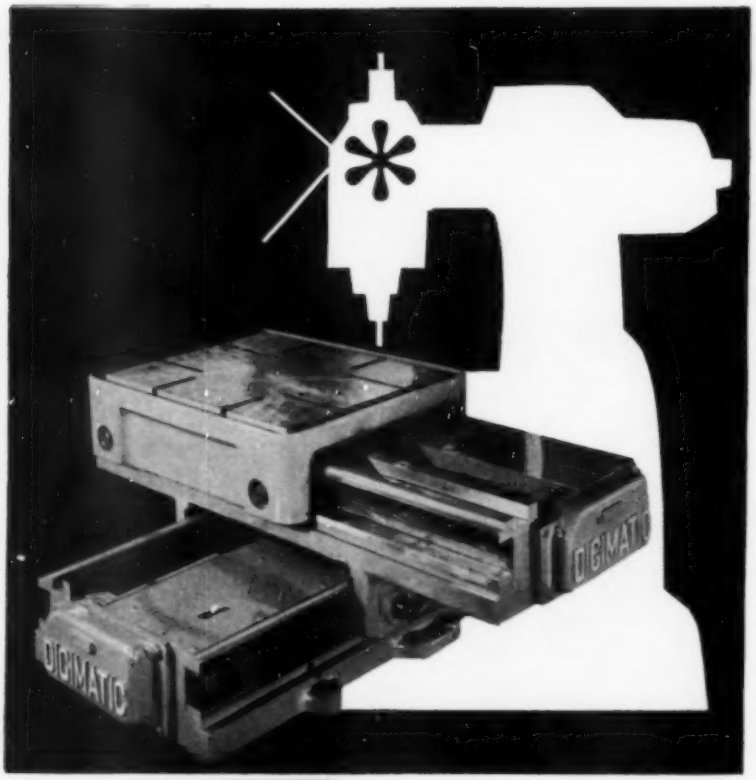
EVERDUR

COPPER-SILICON ALLOYS

products of

ANACONDA®

Made by The American Brass Company



now! practical, economical **automation** for your present equipment!

DIGIMATIC

point-positioning control system

enables one drill press to do the work of **5**

DIGIMATIC MODEL 202 Point-Positioning System Saves You Money By:

- *Simplified Drawing Procedures*
- *Faster Set-Up Time*
- *No Jigs Required*
- *Faster, More Accurate Drilling*
- *More Productive Machine Time*

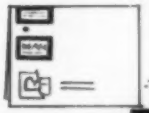
Now Available for Immediate Installation. Write for illustrated brochure giving complete details and specifications.

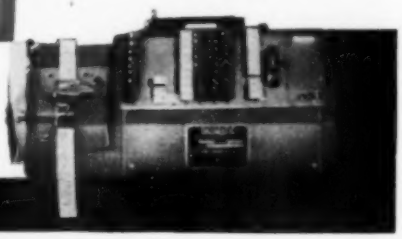
AUTOMATIC PATH CONTROL SYSTEMS ALSO AVAILABLE FOR YOUR PRESENT CONTOUR MILLING MACHINES

DIGIMATIC Compound Servo Table. Accuracy: ±0.001. Adapts to any drilling equipment. One day installation.

DIGIMATIC Model 202 Control Unit with Tape Reader. Numerical Control for drilling, spot welding, riveting, tapping, automatic assembly operations.

DIGIMATIC Tape Preparation Unit. Programs drilling operation from shop drawings. Simple to operate as office calculating machine.





ECS

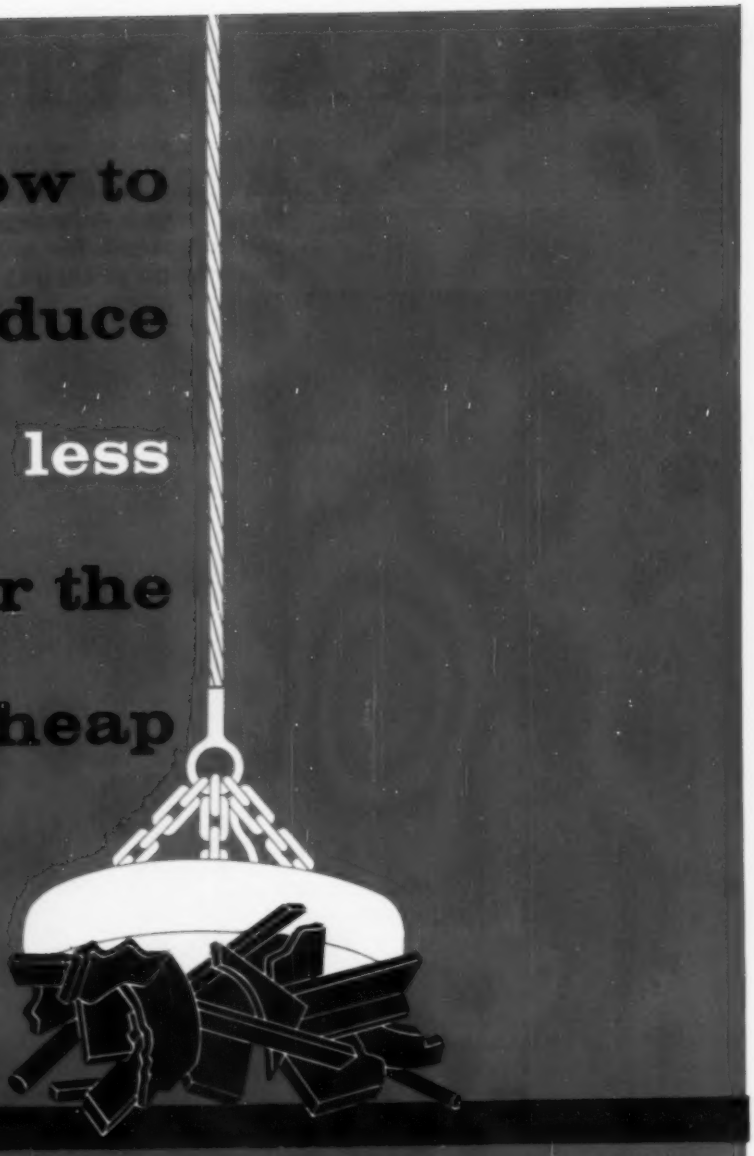
ELECTRONIC CONTROL SYSTEMS

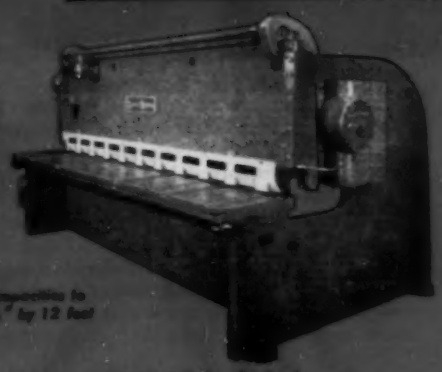
DIVISION OF **STROMBERG-CARLSON COMPANY**

A DIVISION OF GENERAL DYNAMICS CORPORATION

2231 South Barrington Avenue, Los Angeles 64, California

how to produce less for the scrap heap





capacities to ¼" by 12 feet

your LODGE-ical choice...

Lodge & Shipley

Check your scrap "production." A certain amount of scrap is to be expected. But, if your scrap heap is growing out of bounds chances are, your shear is a contributor.

Even a skilled operator is at the mercy of a "cranky," inaccurate shear. Put the same operator on a Lodge & Shipley Shear with "built-in" accuracy and watch production flow. Lodge & Shipley Power Squaring Shears are proved for accurate shearing . . . produce far less for the scrap heap and far more for production.

For details, request New Condensed Catalog PS-13. Write: The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio

WHAT A DIFFERENCE

● MODULAR DESIGN . . .

Meter switch units are standardized for lower cost and self-contained for quick interchangeability. *Result* — lower gage price, gage downtime virtually eliminated.

This Air-Electric Gage can simultaneously check 11 separate crankshaft dimensions at a rate of 800 per hour (8800 measurements!).

There isn't a production line gage in use that doesn't need care and service. Good design keeps this to a practical minimum. However, few, if any, designs have been aimed deliberately at reducing the amount of time needed to effect service or replacement . . . a critical consideration in production costs. But Federal's MODULAR design arranges construction so that gage downtime is reduced to moments. Only four screws, two finger-tight air hose connections and an electrical connector are involved in replacement of one meter unit by another. Then the replaced unit can be serviced at the bench when convenient. And, with Federal's one-master air system, setting the replacement unit takes only *10 seconds*. Even though the overall gage design is special to suit the particular requirements, these MODULAR units are standardized, which means lower first cost.

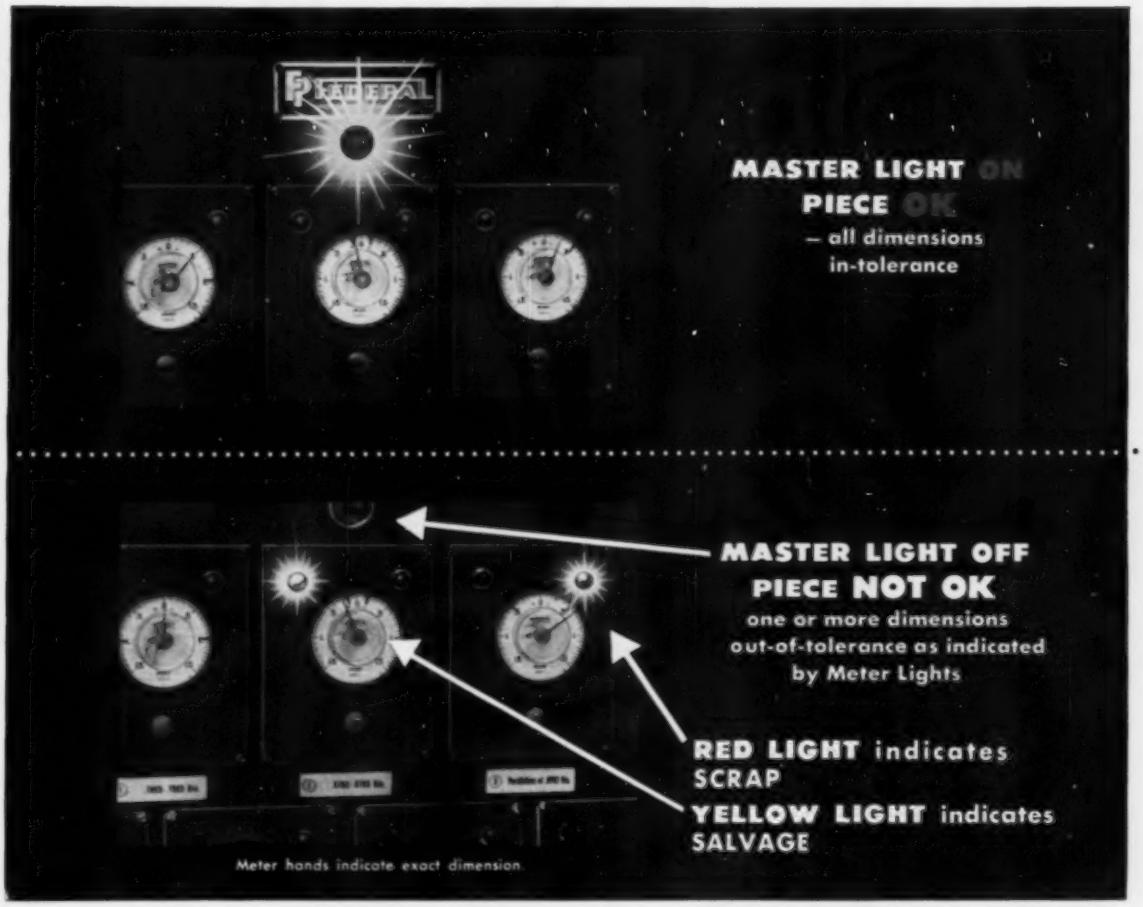
Get in touch with your Federal representative and investigate MODULAR design further . . . in terms of your own needs.

FEDERAL PRODUCTS CORPORATION
8123 Eddy Street, Providence 1, R. I.

IN GAGING ECONOMY!

● MASTER LIGHT CONCEPT...

Lets gage's accuracy, rather than operator's judgment, determine piece acceptability. *Result* — gaging speed doubled, errors eliminated.



Ordinarily, a multiple dimension gage requires the operator to determine—from scanning a row of bobbins or meters—the dimensional conformance of the piece being gaged. To keep up with the production pace, this must be done quickly . . . often leading to errors, especially in borderline decisions. Also, the fatigue factor in this type of gaging is high, accounting for additional inspection errors.

But Federal's MASTER LIGHT concept eliminates these errors by making acceptability decisions for the operator . . . without hesitation . . . without prejudice . . . without fatigue . . . *without error.* It does more than that, actually. If one or more of the dimensions are "out", the gage spots these and tells the operator instantly whether the piece must be scrapped or whether it can be reworked. Small wonder that this method can increase gaging speed over 100% . . . an increase that can easily mean needing only one gage-operator combination, instead of two, in order to keep pace with production needs.

Another advance that means more economy when you do business with Federal. Talk it over with your Federal representative soon.

Ask **FEDERAL** *First*

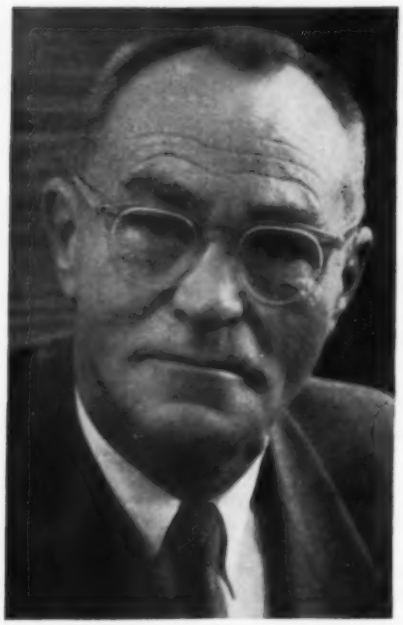
FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Here's what U.S. Steel Supply Special Services mean to Pitter Metal Products, Inc.

"U.S. Steel Supply Special Services help us CUT PRODUCTION COSTS"

says
W. J. Pitter
President
Pitter Metal Products, Inc.
Maywood, California



• "U. S. Steel Supply pre-cuts sheets to any size we want," says Mr. W. J. Pitter, president, Pitter Metal Products, Inc., sheet metal fabricators, Maywood, California.

"We take advantage of U. S. Steel Supply Special Services by ordering our sheets pre-cut. Thus, we eliminate not only profit-robbing delays caused by cutting the sheets ourselves, but also the risk of costly cutting errors. Our labor costs are reduced, and we have no waste or storage problems with pre-cut sheets. The price differential is *more* than offset by the speed, variety and technical assistance given by U. S. Steel Supply Special Services."

Steel buyers, like W. J. Pitter, know from experience the value of these dependable services.

Why not put these Special Services to work for you?

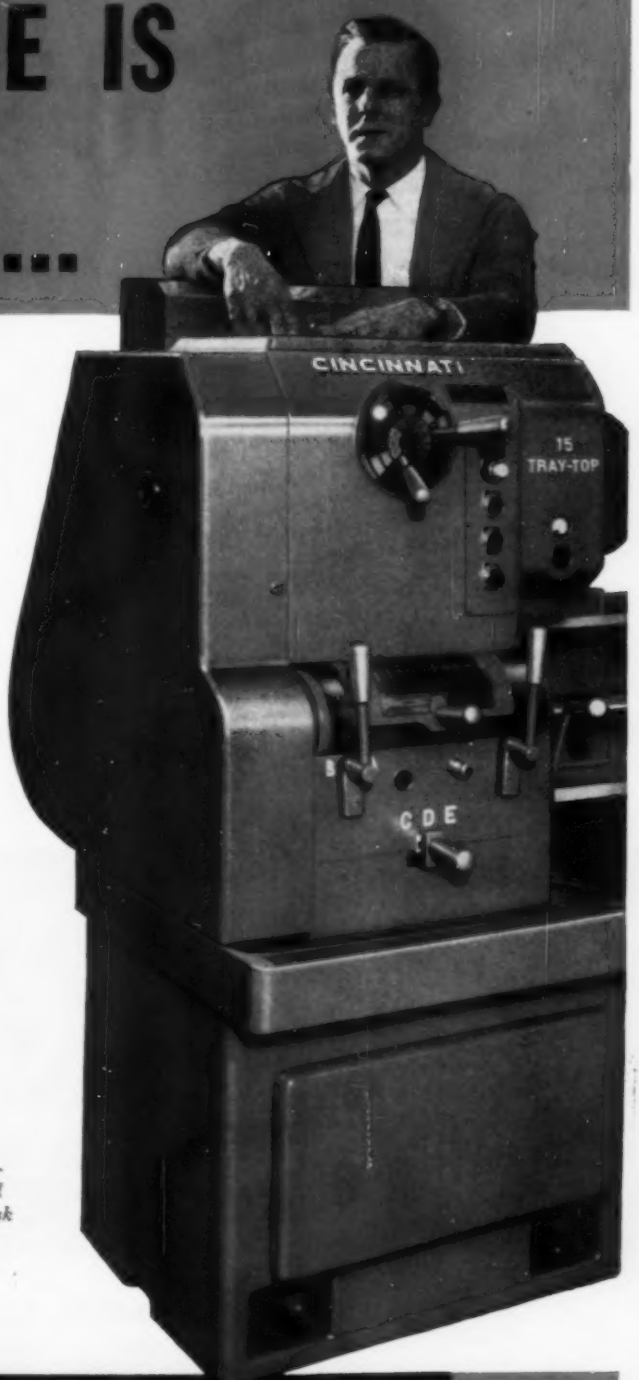
You can use U. S. Steel Supply's flame-cutting, shearing, slitting or coiling equipment, and eliminate the need for this expensive machinery in your plant. If you would like one of our representatives to show you how to benefit from U. S. Steel Supply Special Services, write to U. S. Steel Supply at the address listed below.

U. S. STEEL SUPPLY
DIVISION

Mailing Address: P. O. Box 1099, Dept. W3, Chicago 90, Ill.
General Offices: 208 So. LaSalle St., Chicago 4, Ill.
Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

THIS LATHE IS WORTH MORE...



It gives lower production costs, less downtime, fewer rejects. And economy-priced Cincinnati Tray-Tops are husky and versatile enough to handle some of the jobs that often tie up heavy duty machines.

Wide spindle speed range in geometric progression provides the right speed for every job; *full feed range* meets all roughing and finishing needs; *control convenience* affords minimum operator effort with maximum safety; *rugged construction* assures maintained accuracy and lowest maintenance costs.

Do You Have Your Copy of This Booklet?

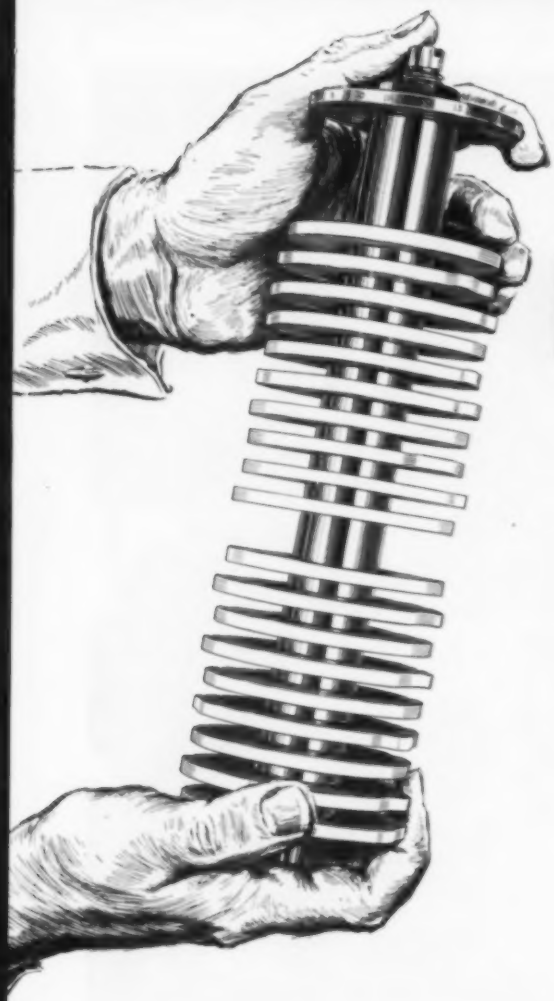
It tells you how to determine if a lathe will be a money-maker. Ask your C L & T Dealer, or write us direct.

Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street • Cincinnati 9, Ohio

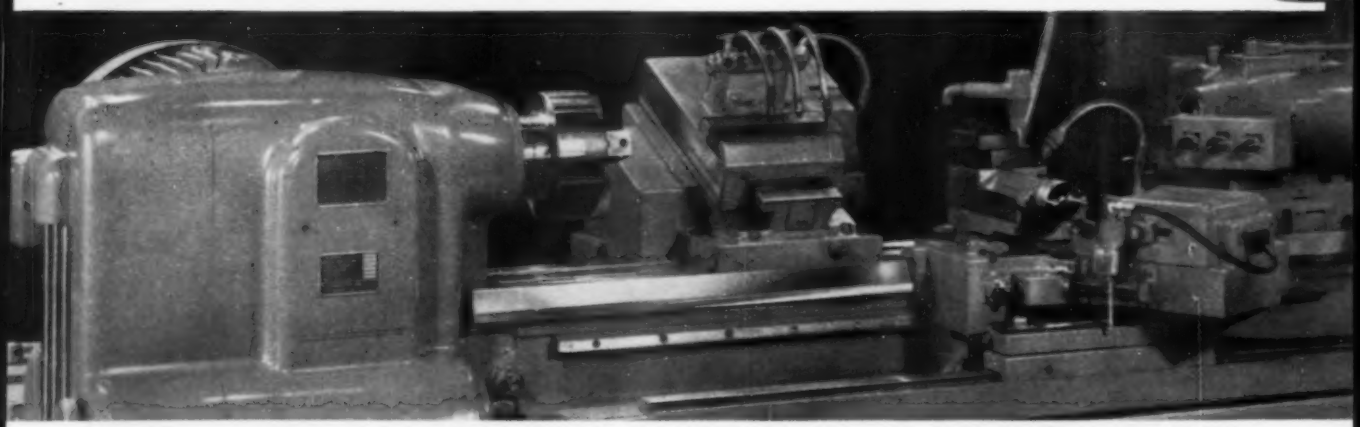
"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners



He's holding

Multi-cycle programmer is the name. And it's only one of many built-in features which make the Monarch Model 21 Mona-Matic the most productive automatic cycle lathe available today.

You can use the Model 21 for a hundred or a million parts. The programmer method cuts setup time to such an extent that switching over from one part to another is accomplished just about as quickly as job change on an engine lathe.



Flexibility Unlimited

Drive motor may be single speed or two speed. Or inbuilt *constant surface cutting speed* may be provided. This often increases production 30 to 40% on shaft turning, even more on facing cuts and forgings. . . . You can get a *two-position tool holder;* one position for a roughing cut, the other for a finishing cut. Indexing is automatic as a part of the cycle. Think what this means in increased production and better tool life . . . Might chip disposal be a problem? Then a *power chip conveyor* is for you. It removes chips from the machine automatically . . . Keep chips and coolant under control with a *chip and coolant guard* that functions at will of operator or automatically at proper time during cycle.

an automatic cycle

The Model 21 has all the power needed to utilize the full productiveness of carbide tooling; has the speed to take advantage of the economies inherent in ceramic tooling.

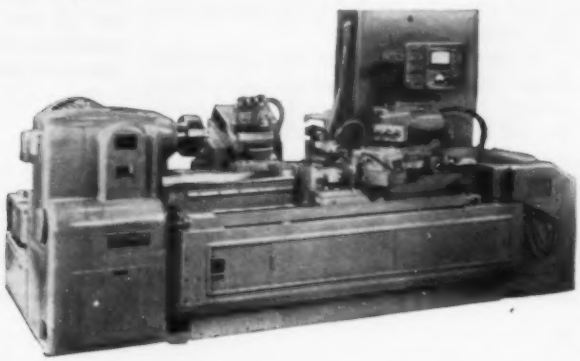
This machine may be used with equal efficiency on one, two, three or four cut cycle work while the switch from one cycle to another is accomplished in most cases by doing nothing more than changing the multi-cycle programmer and making a few quick readjustments at the front of the machine.

Get all the benefits of the time-proved "Air-Gage Tracer"—the most accurate lathe duplicating device known, so fast in operation that the only cycle speed limitation is imposed by what the tool will stand.

When you buy a production lathe, RESULTS are what you want. That's what you get in the Model 21. Booklet 1808, yours for the asking, tells why in detail. **The Monarch Machine Tool Company, Sidney, Ohio.**

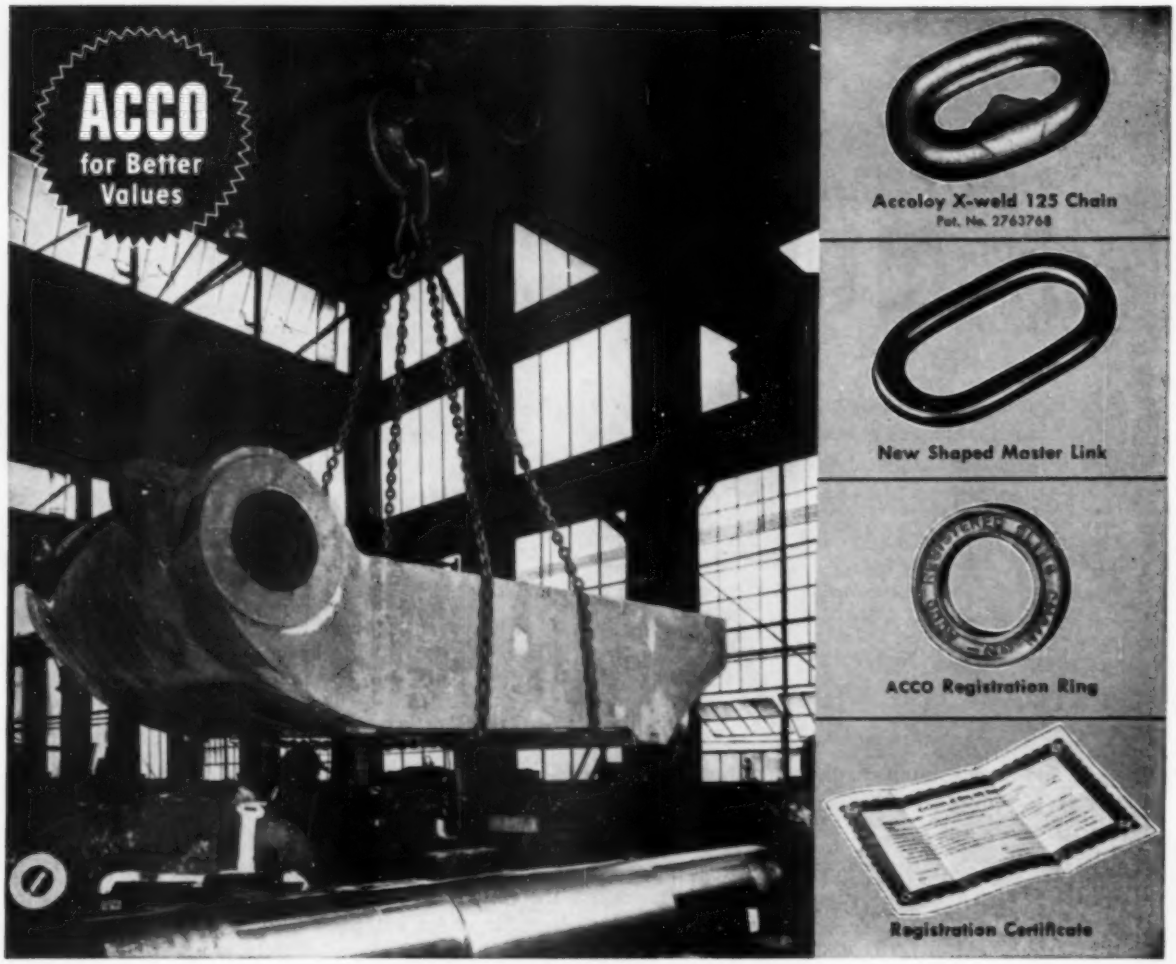
The above statement that the Model 21 is loaded with production features is not an idle one. Here are some of them.

- Automatic feed change with up to six different feeds, each of which is infinitely variable and each of which may be made operative at any time during the cycle. This is a Monarch exclusive.
- All feeds adjustable under cut. Such flexibility is desirable on some work where it lengthens tool life and thereby increases day in and day out productiveness.
- "Air-Gage Tracer" utilizes the combination of air-hydraulic control. This accounts for a stylus pressure of only five to six ounces against the template. There is no appreciable template wear; accuracy of template shape reproduction is within ± .001" on most jobs.
- All way surfaces flame hardened and ground. Included are bed ways, "Air-Gage Tracer" slide and rear slide way surfaces. The accuracy built in is retained year after year.
- Work piece change speeded by a single lever on tailstock. This is a multiple position lever which in proper sequence controls both the tailstock center and the air operated chuck.
- Rugged rear carriage for auxiliary machining operations, timed to take its cut at any point during the cycle.
- Automatic lubrication; from end to end, all the time.



Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A BETTER TURN FASTER . . . TURN TO MONARCH



Big, costly loads are safe with Acco Registered® Sling Chains

• Pictured above is a huge, 35,000-pound casting being lifted *easily and safely* by a 4-leg ACCO *Registered* Sling Chain. Directly beneath the load is a highly polished and machined crank shaft worth many thousands of dollars.

Imagine the cost in lost labor and materials, should the sling chain fail! But it won't fail—for this ACCO *Registered* Sling Chain and all its components have the inbuilt strength needed to handle the job with complete safety!

When you buy an ACCO *Registered* Sling Chain, you get these four exclusive "plus values" which *add materially to the worth, but not to the cost,* of the sling:

1 • **Accoloy X-weld 125 Chain**, for extra strength. This chain hangs straight . . . does not kink . . . has extra resistance to bending.

2 • **New Shaped Master Link**, uniquely shaped to withstand deformation under loads up to 18% greater than a round-section link can do.

3 • **ACCO Registration Ring**, serially numbered as evidence that the assembled sling has been factory proof-tested to twice its working load limit.

4 • **Registration Certificate**, signed by us, attesting to the field-tested design and proof-testing of the complete sling.

Remember, the best sling is one of your most economical material-handling tools. You'll find it good business to consult your ACCO *Registered* Sling Chain Distributor on all your sling needs; his counsel is available without obligation. If you don't know his name, write us at York, Pa.

WHAT "ACCO REGISTERED" MEANS

1 The best material
2 Unit safety factor (on bodies, rings, links, hooks)
3 Proof test of complete sling to twice the working load limit
4 Actual field service test of each design
5 Metal identification ring on each sling
6 Signed Registry Certificate with each sling

American Chain Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

***Indicates Warehouse Stocks**

ACCO

ACCO Registered® Wire Rope Slings

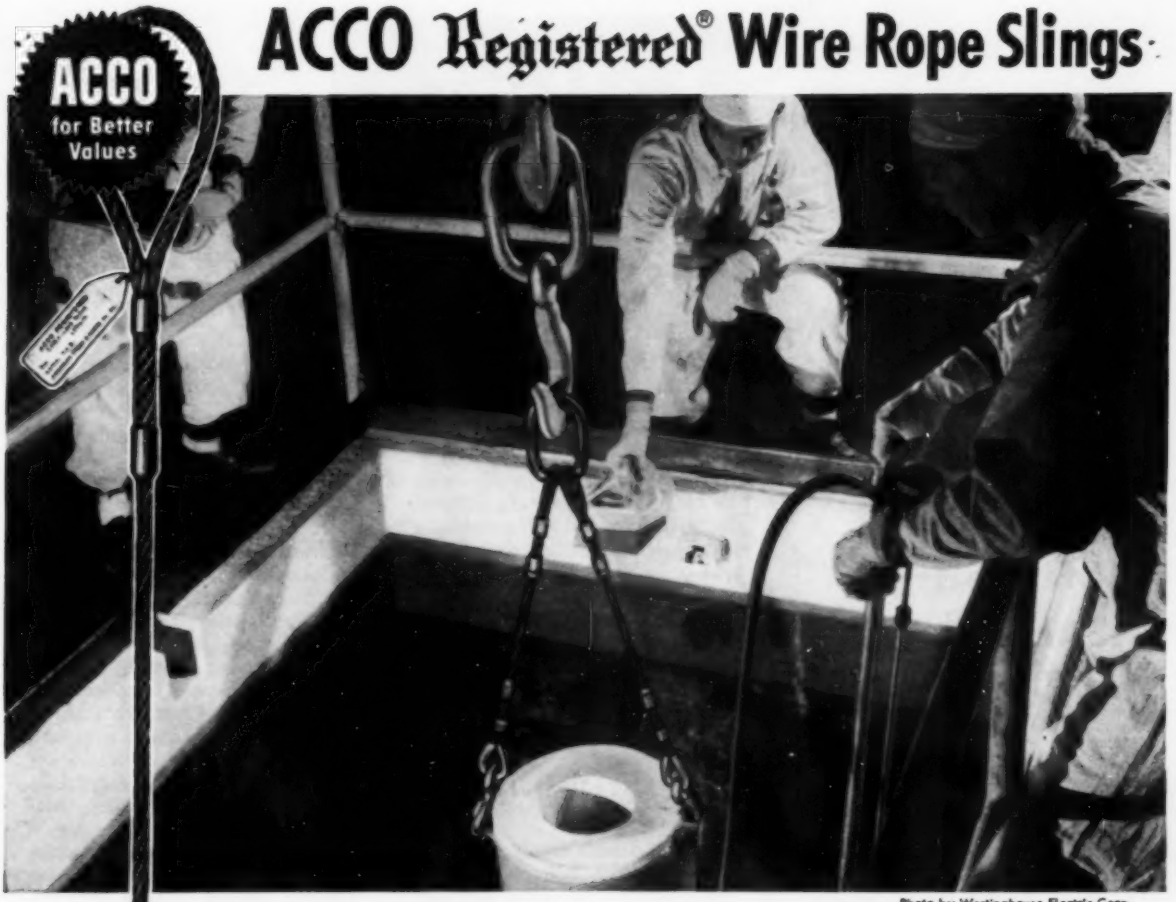


Photo by Westinghouse Electric Corp.

STAND BY—Radioactive Material Below!

The safe handling of this load of radioactive material rests in the hands of irreplaceable scientists and technicians. They've been given the safest and most modern handling equipment available to do their job—including ACCO *Registered* Wire Rope Slings.

Chances are the lifting of your product does not require the services of skilled "hot lab" technicians. Nevertheless, your rigger is also a skilled technician who shares heavy responsibility in the daily production of finished products or assemblies worth thousands of dollars. He is also entitled to the best tools available for doing his job, as is any other workman in your plant.

And the best slings you can give him are ACCO *Registered* Wire Rope Slings. Each is a precision-made tool that offers the modern patented wire rope ending—DUALOC. See box at right for other features these great slings give you.

FREE 52-Page Catalog No. 9—contains helpful information about strengths, weights, dimensions—also prices—of ACCO *Registered* Wire Rope Slings. Write our Wilkes-Barre office today.

WHAT "ACCO REGISTERED" MEANS

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification tag on each sling
6. Signed Registry Certificate with each sling

ACCO AMERICAN CHAIN & CABLE COMPANY, INC.
WIRE ROPE SLING DEPARTMENT

Wilkes-Barre, Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex.
Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.
In Canada • Dominion Chain Company Ltd., Niagara Falls, Ontario

NEW
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fluted
REAMERS
by L&I

New Tools for Miniaturization... Companion Tools for Micro-Drills

L&I announces a new line of miniature reamers which are standard in sizes from #80 (Wire Gage .0135) through #61 (Wire Gage .0390). These reamers are perfectly engineered miniatures of L&I larger straight shank straight flute reamers, ground from the solid. They are provided with end relief and are made to a tolerance of +.0002", −.0000"! They are also available in intermediate decimal sizes. A complete set of 20 reamers is also ready.

See your L&I Distributor now, or write for his name.

L&I

"the reamer specialists"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Metallizing

Dear Sirs:
In the article, "200 times the punch life with metallized moly" (*AM*—Dec 30 '57, p77), you described a process for metallizing with a Metco gun.

We are interested in obtaining the address of the manufacturer of the Metco gun and will appreciate your assistance in this connection.

Paul Hass
Mendon, Mich

Inquiries should be addressed to Mr H L Lederman, Metallizing Engineering Co, Inc, 1101 Prospect Ave, Westbury, Long Island, NY —Ed.

Vocational training

Dear Sirs:
I have read with considerable enthusiasm your editorial, "What You Can Do For Your Schools" (*AM*—Jan 13 '58, p95).

We, who are engaged in the business of supervising and promoting vocational education and education for the technician, are thinking exactly as you have expressed yourself in this editorial. We find it difficult at this time to arouse much enthusiasm for it among professional public educators.

We find that men in industry are beginning to see that it is not more engineers that are needed. If those already employed could be taken out of the technician job and placed at the level for which they are trained, the supply would be adequate. This cannot be done, of course, until there is an adequate supply of technicians trained to do the tasks that do not require a graduate engineer. None of us would discredit the importance of mathematicians and scientists to our modern technology, but very few things would get off the drawing board, much less off the ground, if it were not for the skilled worker and the technician.

It is encouraging to find articles like yours and a few others that

SHOPMATES

N. Jarvis

I'VE DONE SOME STUPID THINGS FOR YOU GUYS BUT HANGIN' LIGHTS WITH A PLUMB BOB BEATS 'EM ALL !!
I CAN'T DO THIS KINDA WORK WITHOUT A DECENT LIGHT TO SEE BY !!
BUT HE NEVER TURNS 'EM ON !!

Missing Something ?

The Answer is Pink !

Switch to PINK CIMCOOL

Yes, if you're missing that extra something in *your* shop, try CIMCOOL for metal cutting jobs. The famous CIMCOOL° family of cutting fluids covers every job, every type of work and metal. Discover how the famous pink cutting fluid can lower costs and increase production in your plant.

Here are three reasons why CIMCOOL has become the largest selling chemical cutting fluid in the world:

CIMCOOL LOWERS COSTS because it's longer lasting in machines. Therefore, it reduces downtime and cuts labor costs for cleaning and changing.

CIMCOOL PERMITS FASTER SPEEDS and feeds, because of its chemical lubricity. It combines friction reduction and cooling capacity in a degree never before attained by old fashioned lubricants.

CIMCOOL IS CLEANER TO USE because it doesn't soil hands or clothing. It contains no skin irritants. And it's safer because it leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So don't keep things *under* your hat . . . call your CIMCOOL Distributor today. He'll be glad to give you full information on all the advantages of CIMCOOL Concentrate—as well as details on the entire family of CIMCOOL Cutting Fluids. YOU may be missing something!

Or contact us direct and we'll have one of our Cincinnati Milling trained machinists call on you—without cost or obligation, of course. Write, wire or telephone, Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CIMCOOL CUTTING FLUIDS

CIMCOOL **52 Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMPLUS—The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates (AA, NC, SS)**—For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

Also, CIMCOOL Bactericide and CIMCOOL Machine Cleaner.

for 100% of all metal cutting jobs. The Answer is Pink!

Production-proved products of The Cincinnati Milling Machine Co.

° Trade Mark Reg. U.S. Pat. Off.

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

NOBLEWEST *Precision*
ROLL GRADUATING MACHINES

WHEREVER machines and instruments require precisely graduated dials or collars for accurate setting, Noblewest equipment provides the fastest and lowest cost production method. Employing the famous **Noblewest Roll Marking Process** these machines graduate and number each piece with **machine tool accuracy** in a matter of seconds. Both graduations and numbers are **permanently indented** . . . easy to color fill . . . last as long as the part itself. Model 460, illustrated, is equipped with a unique electro-pneumatic control system for fully automatic operation. It will graduate and number dials and collars up to 7" diameter with precision and uniformity at a fraction of the cost of any other method. Can be tooled for tapered dials to approximately 20 degrees. Noblewest also manufactures **linear** graduating machines that will accommodate lengths up to 3 feet at a production rate of 25 fpm. For complete information and catalog, write Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

Noblewest graduating and scale dies are made with micro-precise accuracy. You can't buy finer . . . yet they are competitively priced.

Visit the Noblewest MARK-O-RAMA Booth 837 at the Tool Engineers' Show

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES
NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
MARKING
NUMBERING
EMBOSSING
GRADUATING

are gradually appearing to turn the attention of the mass of people who are at present planning dramatic changes in our basic education structure. Before many changes occur, I sincerely believe that there will be some sober reflections on the needs expressed in your editorial. I am grateful to you for your efforts.

When I express these thoughts to general educators, their first impression is that I am prejudiced. When you express them, it carries more weight.

E M Claude, *Chief*
Trade and Industrial Education
State of Illinois
Springfield, Ill

Dear Sirs:

In the interests of the Patterson Vocational School, Dayton, Ohio, and of the vocational training program in general, we would like your permission to reprint your editorials . . .

We believe they will help arouse interest within the school system here in Dayton and elsewhere. We plan to forward them to individuals, manufacturers, and government officials, both local and national.

The hue and cry for more scientists is fine, but we also need a tremendous amount of highly skilled, mechanically minded people to back up each and every scientist. These mechanically inclined people can get a good start in the freshman year of high school if they are trained in a well-equipped machine shop, whether it is a vocational or secondary school.

C W List
Dayton, Ohio

Helpful Henry

by L. Hoppes

"Sorry, line looked dry!"

CALENDAR

Society of Automotive Engineers—Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

Society of Automotive Engineers—Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

American Welding Society—Annual Meeting and Welding Show, Apr 14-18, Kiel Auditorium and Hotel Statler, St Louis, Mo.

Design Engineering Show and concurrent ASME conference on Design Engineering, Apr 14-17, International Amphitheatre, Chicago, Ill.

AIEE, ASME, IRE—Joint Conferference on Automatic Techniques, Apr 14-16, Hotel Statler, Detroit, Mich.

Metal Powder Association—Annual Meeting and Powder Metallurgy Show, Apr 21-23, Sheraton Hotel, Philadelphia, Penna.

American Society of Tool Engineers—Tool Show and Annual Meeting, May 1-8 (closed Sunday), Convention Center, Philadelphia, Penna.

National Tool & Die Manufacturers Association—Spring Meeting, May 3-6, Hotel Statler, Washington, DC.

American Society for Metals—Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

American Supply & Machinery Manufacturers Association—Triple Industrial Supply Convention and Exhibition, May 26-28, Madison Square Garden, New York, NY.

National Materials Handling Exposition and concurrent ASME conference on Materials Handling, June 9-12, Public Auditorium, Cleveland, Ohio.

American Institute of Industrial Engineers—National Conference and Convention, June 12-13, Hotel Statler, Los Angeles, Calif.

THIS BOOKLET . . .
Simplified Our Tool Planning and Helped Us Speed Up Production
WITH OUR
REED
Thread Rolling Attachments

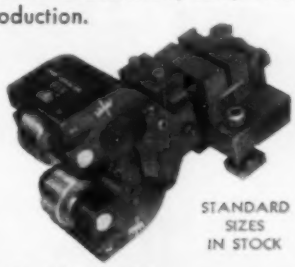
Application and Operating Instructions:
REED THREAD ROLLING ATTACHMENTS SERIES B, TWO-ROLL TYPE
REED ROLLED THREAD DIE CO.

Engineers, setup men, operators . . . all find helpful information in this booklet, "Application and Operating Instructions," furnished with every Reed Thread Rolling Attachment . . . and available to manufacturers tooling machines for thread rolling.

It furnishes data to help reduce operating costs and produce high quality threads. With this booklet, setup men without previous thread rolling experience have successfully completed the setup for production.

REED Engineering Service . . .

- Complete Technical Information for the selection of equipment and tooling for your requirements.
- Highly Skilled Personnel to assist with the initial installation as well as subsequent threading applications.



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Write for Attachment Application Booklet B-101

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U. S. A.

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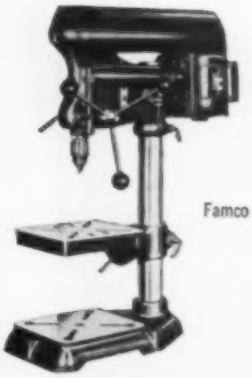
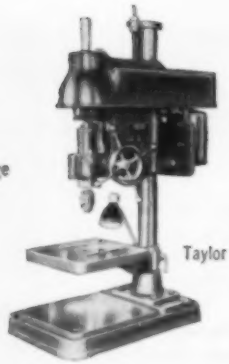
Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto



Famco

Walker-Turner

Buffalo Forge



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put their money on

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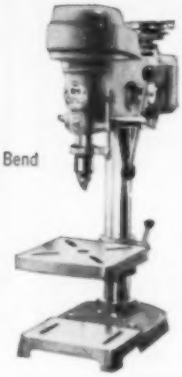
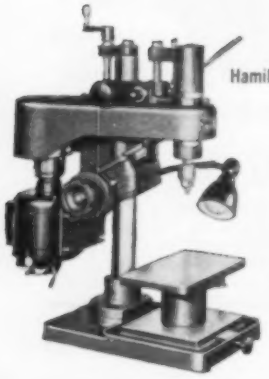
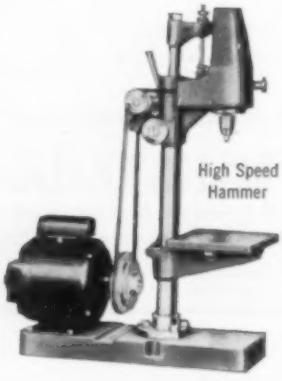


South Bend

Sears' Craftsman

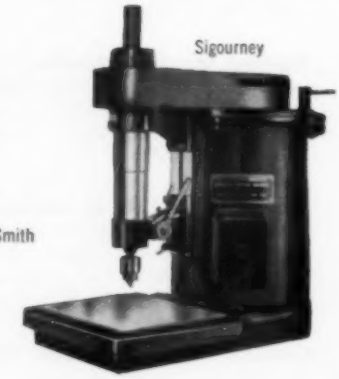


Hamilton

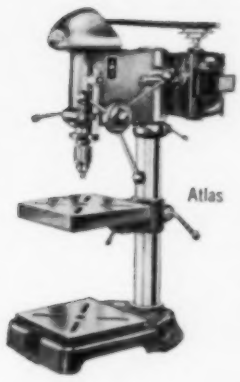


High Speed Hammer

Shop Smith

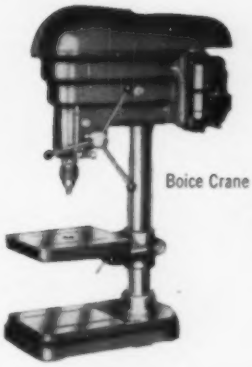


Sigourney



Atlas

Avey



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Cycle Analysis

Sheffield's new Monitorecord* system analyzes timing by means of a printed, composite time graph. This shows every start, dwell and stop of each interrelated event in the complex machine cycle – just as it occurs.

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What could serve Preventive Maintenance more effectively than taking such a graph every day? What could save as much set-up time? This system often justifies its cost the first time it is used.

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Get all the facts on this profit-conserving idea. Write to the *Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.*

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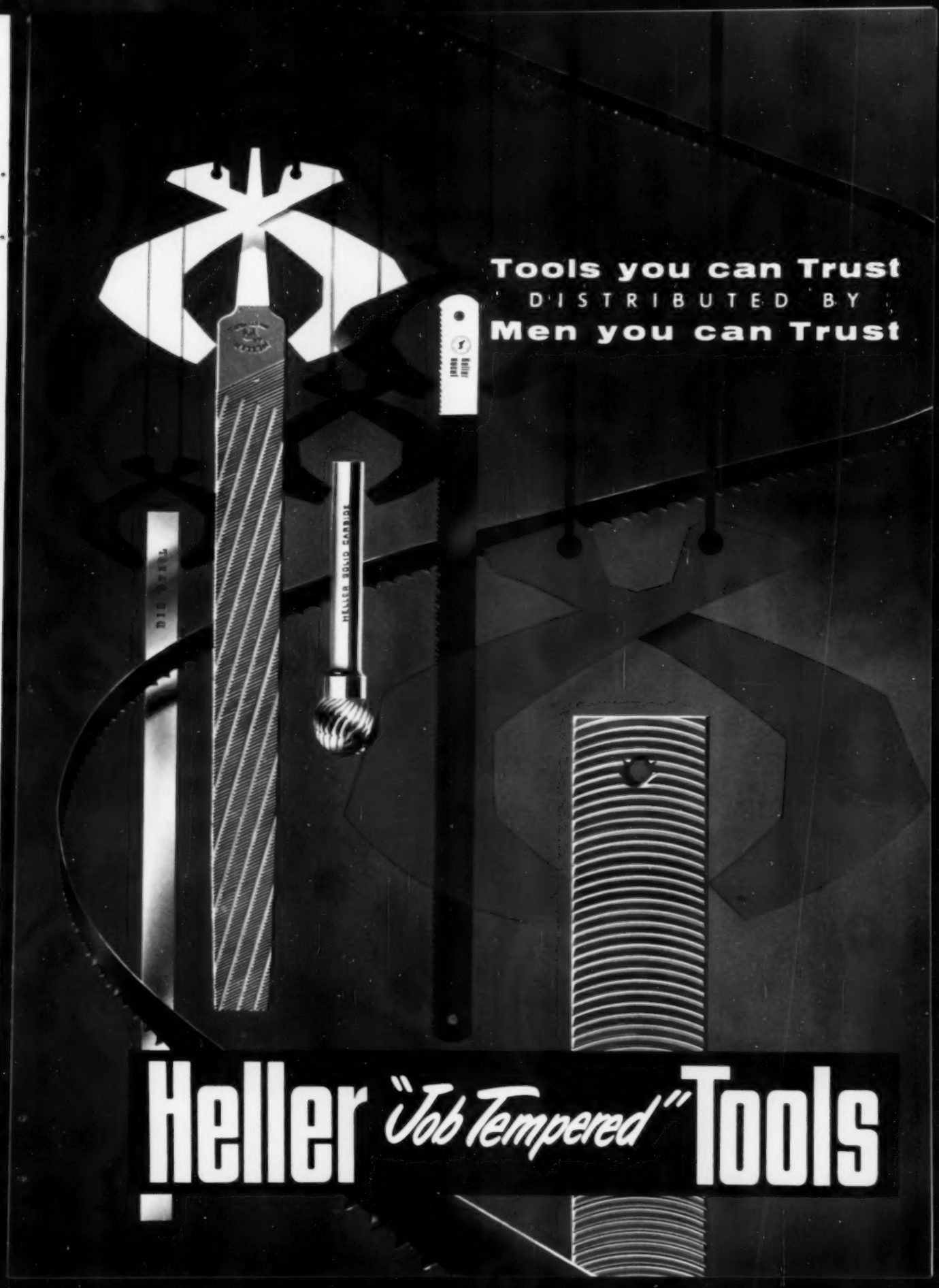
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SPOT NEWS...

- **Application to raise tariff barriers on machine tool imports** will be made to the Tariff Commission by the National Machine Tool Builders' Association on grounds that the industry is seriously threatened with injury by the growing influx of foreign machine tools. Alternatively, NMTBA may appeal to the Office of Defense Mobilization on grounds that such imports are threatening national security. More on p105.
- **Three new MIG welding processes for aluminum** eliminate contaminants and reduce porosity by introducing a shielding gas into the inner core of the arc. Developed by Kaiser Aluminum, the processes are called "Qualiweld," "Econoweld," and "Chloreon." Small amounts of chlorine are mixed with the gas.
- **Indications that aircraft primes are tooling up to do the work of subs are reported** by West Coast used machinery dealers, who say bulk of current sales are to primes for tools ordinarily required by their subcontractors.
- **Centralized automatic control system for machine tools,** applicable to small or large shops, is being developed. It works this way: unit attached to each machine feeds in data on (1) downtime, (2) hours machine has run on a job, (3) pieces completed, and (4) pieces yet to go. Phone jack puts foreman in instant touch with central control in case of trouble. System paid for itself ($150,000) in a 500-man plant in a single year by reducing downtime alone.
- **"Glass steel" plastic as durable as steel but weighting 83% less** has been developed in Russia. A 3-story house built of it would weigh only 48 tons.
- **Chevrolet is considering building a pancake-type, opposed 6-cyl engine**—a possible move toward engine-in-the-rear construction.
- **Electroforms of very fine grain nickel of 600 Brinell hardness**—flexible enough in thin sections to be bent by hand—have been developed by a British firm. Thin, electrically conductive plastic sheet is laid over the mandrel, then metal is deposited. The finer the grain size of the conductive material, the finer the nickel grain size—and the higher the hardness. Technique has produced copper of 380 BHN, lead of 170 BHN.
- **Red China and Japan will trade machinery and other embargoed items** under terms of a $98 million trade agreement, which would also allow the Chinese Communists to set up a permanent trade mission in Tokyo.
- **Die-cast aluminum auto wheels are being bonded to iron brake drum liners** with a strong bi-metallic interlock by National Lead Co. Bond can be extended to all die-cast metals, achieving high shear and tensile strength. Bond is accomplished by inserting a cast iron brake drum liner into the cavity of a die-casting machine, closing the die, and injecting molten aluminum at 6000 to 10,000 psi pressures.
- **Communist China expects to turn out 18,000 4-ton trucks this year** at its first automotive plant—that's half as many trucks as there are vehicles in all China.
- **Chrysler and Willys have called off their joint Brazilian project** to produce a version of the 1956 Plymouth down there. Chrysler's administrative board killed it because it wasn't sure the Brazilian market would make it worth while to support big, continued tooling outlays. Now Willys may produce its Aero down there alone instead.

Spot index to major News stories...

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This was the result of competitive bushing tests recently conducted at a large automotive plant:

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(per .001" of wear)

57-105

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You certainly owe it to yourself—on the basis of this test alone—to discover the very substantial savings Ex-Cell-O bushings offer you. Test them—in your own plant—against any, or all, competitive bushings.

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WASHINGTON...

Unemployment...

Washington is in a real unemployment turmoil. Both Republicans and Democrats are maneuvering for the favor of the voters this fall—and more importantly—in 1960 when the White House is at stake again. And the sensitive issue of what to do for and about the rising numbers of jobless is the one which has in it the most political dynamite.

Already, the insiders at government agencies are predicting privately that unemployment may be heading for 6-million mark. They don't expect this when the March count is announced in mid-April but they say 6 million could be reached when the April count is announced in mid-May.

What they're saying is that they see no signs yet that there's any turnaround in sight for business generally—one which would sop up any of the 5.2 million who were found unemployed when the February count was announced in March.

Defense contracts and recession . . .

The Eisenhower administration's highly-touted "new policy actions" to pump defense contracts into labor surplus areas is not expected to have much of an impact on the pattern of military hardware procurement.

For years, there's been a standing policy to favor firms in labor surplus areas and small companies in general as much as possible in military procurement.

But there are technical limits on how far such preference can go: (1) premium prices are not allowed, and (2) the shift from high volume or mass production to precision production of smaller quantities of increasingly complex equipment reduces the number of companies with capacity to handle defense work.

Increased defense spending...

. . . is still being counted on as an anti-recession stimulant. Eisenhower and his top aides point to larger contract awards for planes, subs, missiles, and other hardware as helping to counter recession.

But there's no doubt that both the administration and Congress aren't looking to defense procurement for economic sectors that can make the best use of new federal spending.

Instead, the politicians in both parties look to public works projects of all types—housing, highway construction, reclamation, flood control, rivers and harbors—as the kind of economic activity which produces the best immediate political impact and (incidentally) a worthwhile long-term investment for the public good.

Most of the proponents of such public works admit that these projects don't produce many additional jobs quickly. But they have a feeling that voters do identify such projects with their political sponsors. But they aren't sure that the individual Congressman or Senator reaps any particular benefit by making a big fuss about a tax cut.

Capital goods loan to India...

The Export-Import Bank has granted a loan to India for purchase of $150 million worth of wide-ranging types of capital equipment in the US over the next 12 months. The orders will be placed by the Indian Supply Mission in Washington after an Export-Import Bank mission, now in India, recommends how the funds should be specifically earmarked.

US equipment to be bought includes machine tools and other machinery to expand India's facilities for machine tool production, irrigation and reclamation, power generation, transport and communications, mining, textile manufacturing, chemical production, fabrication of heavy structural steel shapes and forms, and manufacture of electrical equipment.

Consumer buying plans...

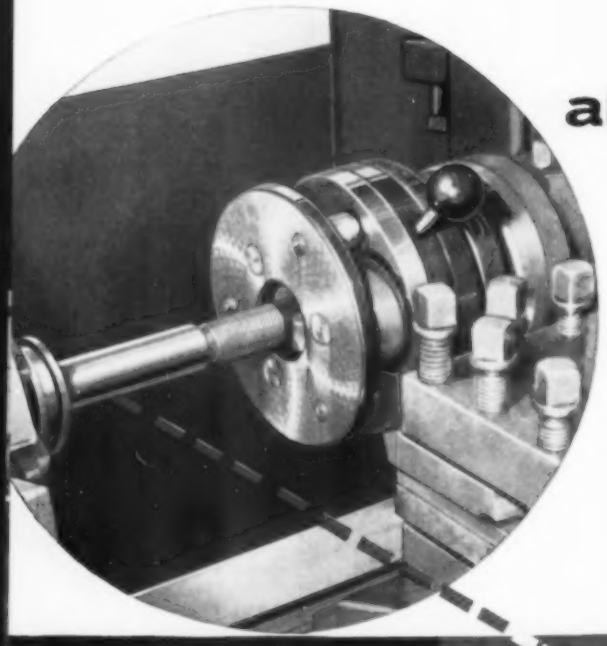
Durables, according to the Federal Reserve Board's recent survey are suffering because (1) the consumer has one eye cocked on the recession, and (2) wants lower prices if he does buy.

The survey shows that only 6.6% of consumers expect to buy new cars this year, compared with 8.7% a year ago. On the other hand, 10.5% expect to buy used cars this year—up from 8.4%. Add the two together and it turns out that about the same percentage expect to buy cars.

And there's only a small decline in the number who expect to buy durables and furniture—28.3% this year, compared with 1957's 29.4%. What about consumer income a year from now? The survey shows 37% expect to make more money, 35% the same, and the rest less.

That compares with 40% who expected to make more money in 1958 as of last year, 35% who thought they'd make the same. The rest expect less or just don't know.

Acme-Fette



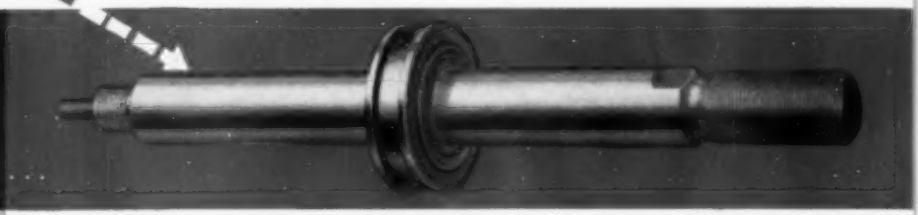
Rolls threads to aircraft specifications for Class 3 fit . . .

Here's a piece that would be costly to thread by single-point chasing or thread grinding. It's a high-temperature hydraulic actuator for aircraft use. The piece is machined from a 4340 steel upset forging with a tensile strength of over 160,000 p.s.i.—heat treated to a hardness of between 36 and 40 on the Rockwell C scale.

After a careful study of the problem, Air-Hydraulic tool engineers assigned the job to Acme-Fette self-opening thread rolling heads.

1"-20, Class 3 thread, being rolled from the end with an Acme-Fette self-opening thread rolling head at Air-Hydraulic Inc., Cleveland, Ohio.

Here's the result. . .



1"-20, ¾"-16, and 5/16"-24 threads were rolled on this actuator 5 times faster than possible with conventional thread cutting dies—thread rolling speeds are equal to turning speeds with high speed tool steels.

Cold-forming action of the Acme-Fette produced a tougher thread and one 60% smoother than grinding or chasing (a 5 micro-inch finish). Rejection rate of less than ½ of 1% meant big savings because threading was the last of a number of costly machine operations.

Threads were produced on existing equipment with the sole addition of Acme-Fette thread rolling heads. Thus, major machine investment was eliminated.

ee Acme-Fette thread rolling demonstration at the ASTE show in Philadelphia, May 1-8

Booth 2115

Find out how you can put Acme-Fette self-opening thread rolling heads to work for you—on your present equipment. Write for your copy of Bulletin NAF-57A. It will show you how you can save money on short or long runs by thread rolling with Acme-Fette.

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DETROIT...

Voice from the bottom...

Auto executives are hoping that March will prove to be the low point of the 1958 sales orbit.

From January 1 to March 8, a total of 966,340 passenger cars were produced, and estimates of dealer stocks stood at 900,000 units—more than a two-month supply. Private production estimates for the calendar year now stand at 4.6 to 4.7-million units.

Detroit reasons that the situation can't get any worse—and it actually never has since the artificially low levels of the Korean War. Current estimates are only 600,000 units above the normal annual scrappage rate. The excess over scrappage must be sold, to be sure, but certainly the nation's corps of 38,000 new car dealers should be able to sign 20 customers apiece during the course of the year.

With any kind of economic boost from Washington, they will probably do much better, so look for these doleful estimates to shoot up with the tulips. It won't be dubbed the usual spring sales surge—just a "return to normalcy."

Out with the old...

All indications are that 1959 model introductions will cluster around the last half of October. This is somewhat earlier than usual. GM will be the bellwether, with its show dates pegged on a revival of the Motorama. The company has already leased space for parts of this period at New York's Waldorf-Astoria hotel.

Strikeout strike...

A combination of economic factors, a weak union position, and an irretrievably poor car sales year makes auto industry strikes much less of a possibility than they were two months ago.

The UAW-CIO, financially hurt by the epidemic of layoffs and short work weeks, will be eager to settle on any palatable basis. Industry's problem now is to make its ideas palatable.

Other labor tidings include final settlement of Dodge Local 3's speed-up gripe. In return for eliminating short work weeks, the union agreed to joint arbitration of work standards. However, a return to five-day production at the plant meant layoff of a further 900 workers.

Big Three negotiations will commence by the end of this month. The contracts all come up for renewal within a day of June 1. Fireworks usually start during the last week of negotiations and are seldom extinguished without extending the old contracts into limbo for at least another week.

Chrysler on the move...

Something is in the wind as a result of the current shuffling of engine-building responsibilities within Chrysler Corp. The Trenton (Mich) facility, once responsible only for low-volume marine and industrial power plants, now is building the new V-8 used in most Dodges, all De Sotos, and Chrysler Windsors.

The six cylinder line, formerly at the Mound Road Plant, has been moved to Trenton. This leaves the high-volume Plymouth V-8 as the only product of the big Mound Road engine plant. The Joseph Campeau facility is left, temporarily at least, with light and medium Dodge truck engines.

The conclusions are inescapable. The first is that the big hemispherical combustion chamber V-8, used since 1951 in top-line Chrysler and Imperial cars and built by Chrysler Division, will be abandoned as of the 1959 model program. The second is that adaptations of this engine to heavy-duty truck installations will also be stopped.

It makes good economic sense for Chrysler to centralize its engine building operations, a move that started with abandonment of the De Soto-built V-8 last year.

Service truck for A-planes?

Wetlaufer Engineering Inc, Detroit, has mocked-up its idea of a truck to service nuclear-powered aircraft. The firm is a consultant to General Electric's ANP Division, prime contractor for the joint AEC, Navy and Air Force off-and-on-again nuclear aircraft project.

The CAB, constructed of 1-ft-thick lead, weighs 65,000 lbs, is placed on screw jacks that can be elevated 15 ft. These, in turn, are mounted on a turntable. Seven 28-in.-thick windows, made of special lead-treated glass, give the driver panoramic vision, but each pane costs $20,000. The 12-ft-wide, 16-ft-long vehicle (150,000 lbs GVW) will be equipped with General Mills manipulators that extend a maximum of 10 ft.

The unit will be powered by a jet turboshaft engine, driving four DC generators, which power motors at each of the four axles. Quadruple wheel assemblies on each axle will rotate a full 360° permitting the vehicle to be driven in any direction, including sideways.

The first working prototype is expected to cost at least $1 million.

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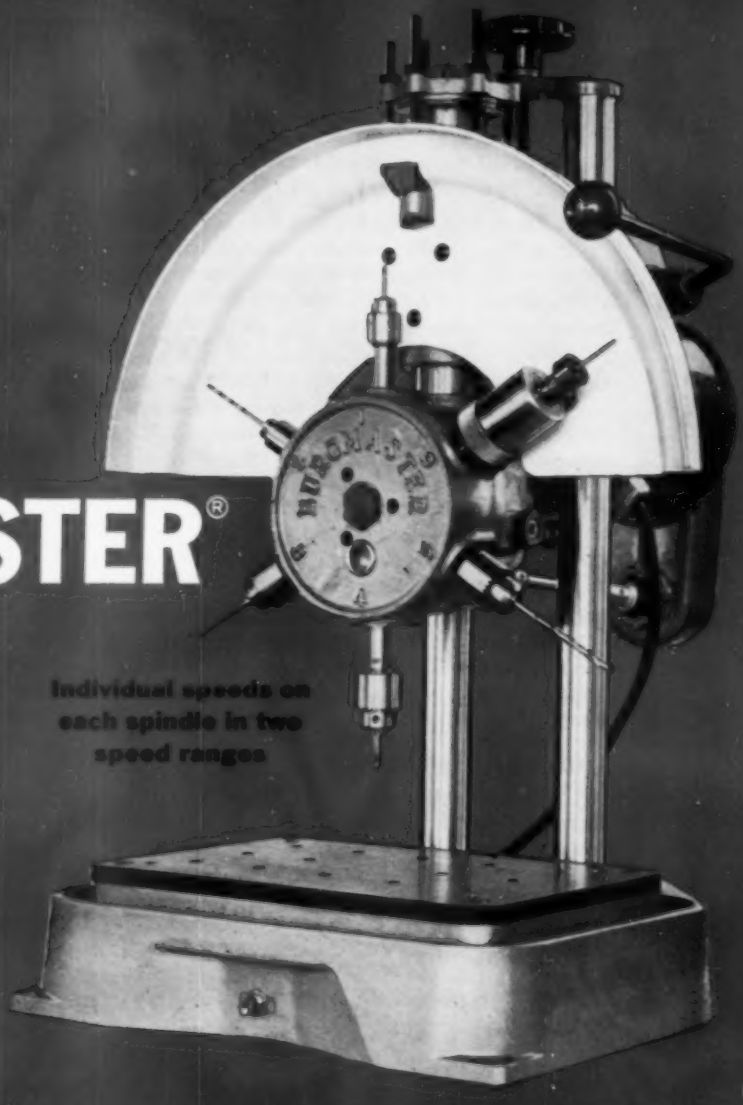

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12-speed, 6-spindle, power-indexing Bench Model Turret Drill

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SPECIFICATIONS: capacity, 3/16" in steel, 1/4" in aluminum; overall dimensions, height, 31½", width, 17", depth, 20"; motor, 1/4 hp; chuck to base clearance, 12"; maximum spindle travel, 2⅞"; center of spindle to column clearance, 5⅜"; geared head permits each spindle to operate at its own predetermined speed from 350 to 6200 rpm.

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TRENDS

Nowhere to go but up?

Checking around the country, the general feeling among aircraft and missile producers, primes and subcontractors, seems to be that the industry is at rock bottom right now—that things can't get any worse and are bound to get better.

What with defense spending, particularly in the missile field, increasing almost weekly (latest in the works—a $1.5 billion step-up. See p99), there's plenty of cause for optimism. Rumors are particularly rife that B-52 bomber output, and that of other manned aircraft, will be stepped up instead of decreased.

But meanwhile, the pinch is still on. Boeing, for example, has cut its employment by 1000 since the first of the year, expects to drop another 9000 workers before the year is out. But hiring of engineers and production trainees is still going on and few people are actually being laid off. Natural attrition—deaths, retirement, etc—in Boeing's huge workforce is expected to account for the entire 9000 terminations, and few others will be laid off.

And the industry continues to expand. New this month are Hughes-El Segundo's tape-controlled production line—the first in the U S and maybe in the world (see p98), and Convair Astronautics' giant new $40-million plant at San Diego, which will turn out Atlas ICBMs. Moving alone, from shared quarters at Convair-San Diego, is costing somewhere in the neighborhood of $2 million.

What about Boeing's Plant 2?

There's a lot of speculation in and around Seattle as to what use Boeing will make of its Plant 2 (main plant) next year.

Reason for all the guesswork is that B-52 production will phase out there next year and the job that was expected to keep the plant humming after that—the new chemical bomber—was copped by North American Aviation. Boeing had gambled that by clearing its production floor (shifting B-52 output to its Wichita plant) it would get the coveted chemical bomber contract—but lost.

Finding work that can be handled easily in the huge Plant 2 isn't easy. Boeing has contracts on hand for upwards of $800 million in commercial aircraft, but its nearby Renton plant is already producing the planes and little help is needed from Plant 2.

Boeing also has large contracts for missiles, but this production has been ticketed for other plant areas. Plant 2, after all, is designed to build large planes, not missiles.

Most likely use of the plant will be as a subcontracting unit for the Wichita Division's B-52 production. Chances are good that the Air Force will increase its output of B-52s, and this would benefit Plant 2 indirectly.

But Boeing may have other plans for the plant. Looking aggressively into the future, Boeing has assigned more than 200 employees to its Advanced Projects Proposal team, which is preparing to submit its first weapons system proposal to the Air Force this month.

While Boeing hasn't disclosed the nature of the proposal, it's believed that it involves development of manned space-research craft. It could have something to do with the Air Force's Project Dyna-Soar, recently outlined to the House Armed Services Committee.

Boeing is known to be stressing a rocket-propelled glide-boost machine in its advanced research program. Dyna-Soar calls for a craft able to reach an initial speed of about 18,000 mph at an altitude of several hundred thousand feet. Idea is that the machine could circle the globe and glide back to its home base.

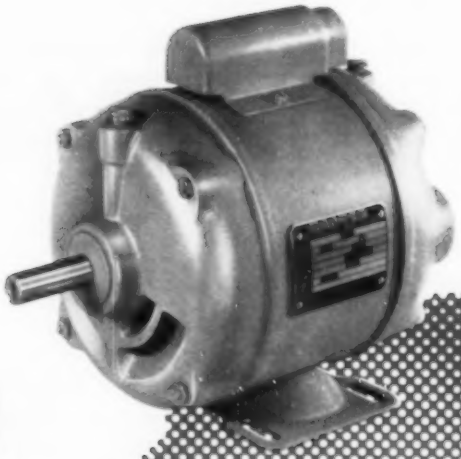
LA's "Space Age" Conference...

Winding up this week is the Western Space Age Conference & Exhibit, sponsored by the Los Angeles Chamber of Commerce.

The Conference, which will be covered fully in the next issue of *American Machinist*, is a top-level get-together for government officials, aircraft and missile primes and subs.

Its program will range widely from subcontracting to tooling. Samples: David H Brown, assistant general manager of Bendix Aviation, will discuss "Tooling for Guidance Systems;" William L Young, operations manager of Convair Astronautics, will talk on "Coordination of Prime and Subcontractors;" Wayne E Harness, superintendent of Planning and Preplanning for Lockheed's Missile Systems Division, will cover "Airframe Tooling;" and Clifford Kennedy, general superintendent of tooling of Rocketdyne Inc, will talk on "Power Plant Tooling."

General idea of the Conference is to bring more aircraft and missile business into the Los Angeles area by acquainting primes and subs with the ins and outs of government contracting, and by disseminating new technical information to area Metalworking firms.



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Construction .....Open, enclosed, fan-cooled, explosion-proof, special purpose.

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Power Drive Features .....Electric brakes (2 types)—5 types of gear reduction up to 432 to 1 ratio. Mechanical and electronic variable speed units—fluid drives—every type of mounting.

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MACHINE TOOLS...

Chevrolet to tool for small car...

Chevrolet is reported to have asked for bids on machine tools to make both four-cylinder and six-cylinder engines for small cars.

Cylinder block is said to be aluminum. Both engines will be air-cooled, according to Detroit reports.

The six-cylinder engine is a pancake-type opposed-cylinder job, leading one to believe that the car is planned for engine-in-the-rear construction. It is not yet known whether Chevrolet plans to proceed with both a four and a six or whether it is merely assembling costs on both.

But indications are that Chevrolet is likely to go ahead with a small car for introduction by the fall of 1959, if not sooner.

At least one major car maker intends to proceed with its so-called transaxle program. This consists of taking most of the hump out of the center of the car floor and improving car operation. It is presumed that tooling for this change will be ready for 1960 models.

Machine tool time purchases grow...

Some 77% of machine tool distributors sold machines on a deferred payment plan in 1957, according to a survey made by the American Machine Tool Distributors' Association and reported at its New Orleans spring meeting by William L Walker, Walker Machinery Co, Cincinnati. Those selling 10% or more of their volume on time totaled 44%, compared with 19% in 1948.

About 11% of distributors using some form of time payment reported that 25% or more of their sales were made on conditional sales contracts. Four companies exceeded 50%.

Today 83% of distributors use conditional sales for at least a portion of their business. That is by contrast with 74% in 1948.

Sundstrand buys Arter line...

Sundstrand Machine Tool Co is buying the product lines—grinders and electronic positioning table—of the Arter Grinding Machine Co, Worcester, Mass.

The Arter plant and equipment will be sold separately and Arter as a company will go out of business. Arter products henceforth will be made at Rockford, Ill by Sundstrand.

Builders import machines and parts

At least one US builder has been making complete machines in Europe for customers here. Demand for this type and size of machine, however, is very limited and if the builder could not make them abroad, he would not make them at all. As it is, he can have them manufactured overseas and shipped back here at a delivered price under that which he would have to charge if the machines were produced here.

Another US builder is known to be making gear boxes in Europe and shipping them to his US plant for assembly into his domestic machines.

He is manufacturing complete machines abroad for the British and continental European markets. The gear boxes are of the same standard design both over there and here. Manufacturing costs obviously are lower in Europe.

Something new at Bullard...

Recognizing that manufacturing techniques are changing rapidly, many machine tool builders are doing more in developing new designs than ever before. They are not waiting for the 1960 Show. Bullard is an outstanding example of this progressive trend. It is preparing for the market a 4-spindle, high-speed vertical "Contin-U-Matic," equipped for contour turning.

A tracer-controlled head is at the right of each working station, and a turning, cross-feeding or special-purpose head at the left of each station. Each station has a tailstock.

Bullard has also developed a 6-spindle, center-turning Mult-au-Matic for producing steering knuckles at a rate of one piece every 8½ sec.

Each of five working stations is equipped with a heavy-duty tailstock, a spindle, contour-turning heads (direct templet, not tracer and cross-feeding heads).

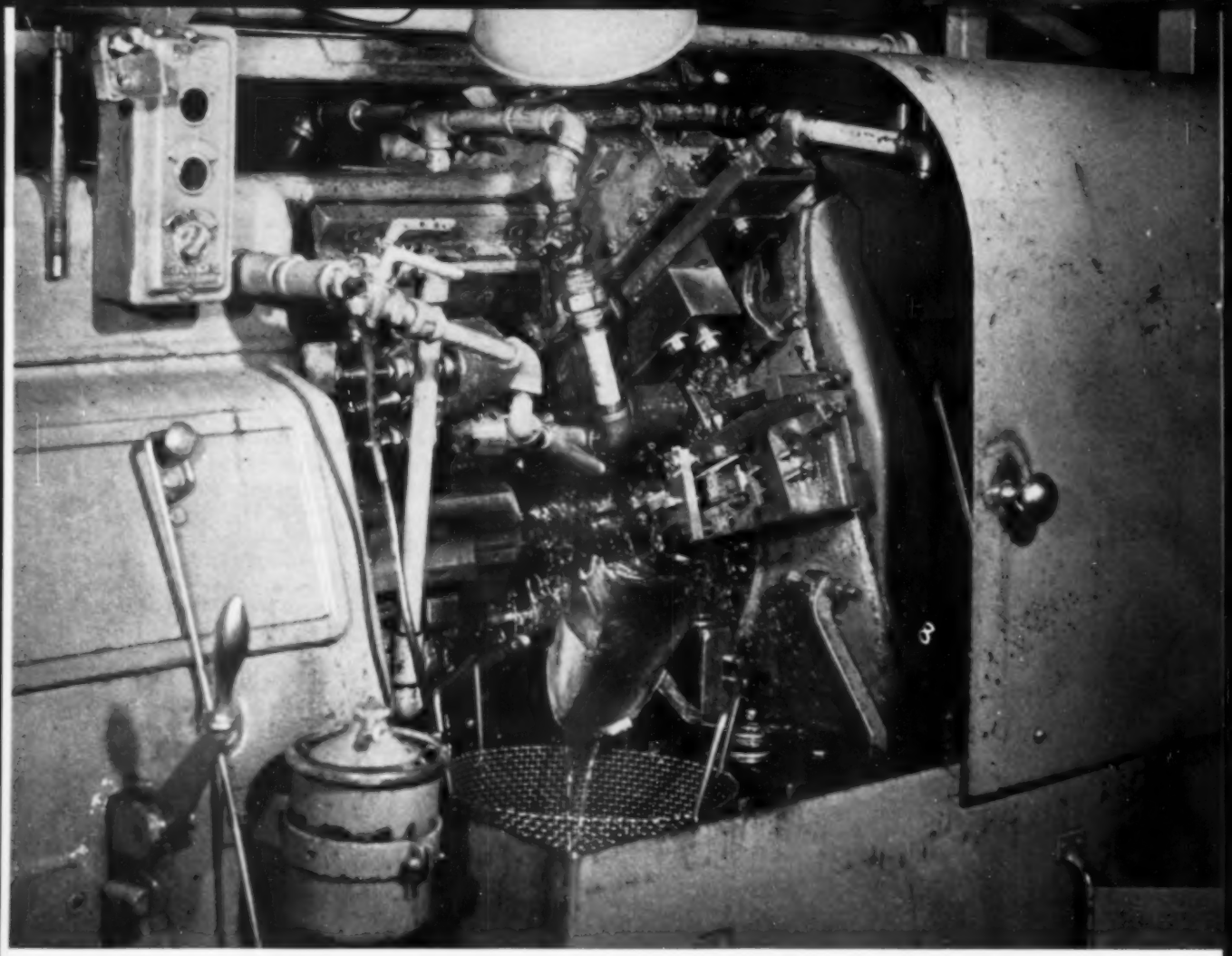
Still another design is the vertical chucking grinder for contour grinding.

Buhr increases capacity 75%...

Buhr Machine Tool Co, Ann Arbor, Mich, has just completed a $1-million expansion program, increasing its capacity 75%. Joseph Buhr, Jr, president, says that the company has six months' backlog. He expects 1958 orders to exceed shipments.

A new plant, for which Buhr owns 59 acres of land in the Ann Arbor area, is on the drawing boards. It will multiply capacity 2½ times.

Buhr now has facilities for building $14 million of machine tools a year. Mr Buhr looks to 1960-1965 as his company's biggest years.



Here's how Transultex reduces automatic screw machining costs

Texaco Transultex Cutting Oil reduces the frictional heat at the chip-tool interface. This prevents chip welding, lengthens tool life and lowers power consumption.

Transultex is transparent, and stays that way in your machines. Inspection is easier. Machined surfaces stay clean, come out with a better finish. Which means fewer rejects, more production.

Texaco Transultex Cutting Oils are part of the complete line of Texaco Cutting, Grinding and Soluble Oils, all designed to help you increase production and lower costs. Simply call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

WHAT'S AHEAD... in Metalworking

TRENDS

Slow opening and a fast finish for '58?

Consensus among Metalworking executives in most major fields is that by year's end industrial and metalworking production will have climbed fast enough and far enough so that 1958's output will be very close to that of 1957—and that means a good year by any standard, despite layoffs, cutbacks and the like.

But the big question confronting everyone is "When will the upsurge come?" By now, industrialists are pretty much inclined to agree that President Eisenhower's prediction of a spring boom is a bit premature. The upswing, they believe, will not come before the third quarter.

That's logical—there are few indications to date that any upsurge can be expected in the next few weeks. By then summer will be almost here, and summer is traditionally slow, with pickups historically coming in the fall.

Much of the nation's industrial prosperity hinges, of course, on the aircraft and automotive industries. The aircraft people report that their situation to date is largely unchanged—although they feel that the worst is behind them. Congress is throwing more and more money into the aircraft and missile kitty—and this is bound to have an effect soon upon the aircraft industry and its myriad suppliers and subs.

The automotive industry, on the other hand, has been constantly revising its estimates of 1958 production downward (latest: 4-million cars) as it fails to overcome buyer resistance.

Automotive industry employment continues to decline, and several plants of even the Big Three are on a three-day week. Eight-cylinder engine production has sloughed off considerably, but six-cylinder output for economy cars continues to stay high. Truck production is generally holding up better than automobile output.

Gray iron foundry industry is one of those that figures it has already "bottomed out," that things will be on the upgrade from here on out, and that '58 will wind up on a par with 1957. GI foundries are mostly on four-day workweeks now, as against three days a short time ago.

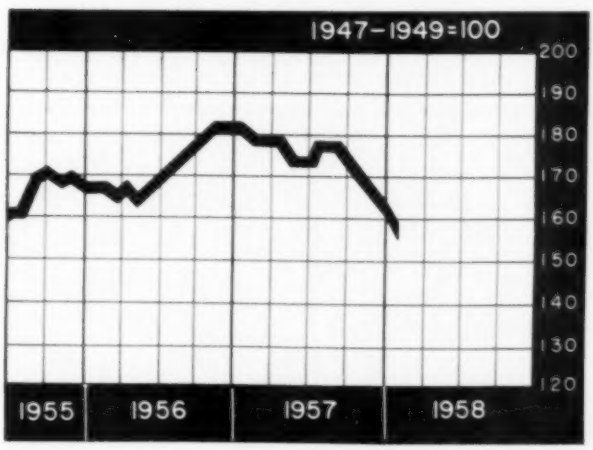
Tool and die industry too, feels that business is taking a definite turn for the better. January orders were up 8% over December, and backlogs rose about 3% during the month.

Stamping plants, however, report a drying up of new orders in recent weeks. One large plant, for example, says "January was worse than December—and December was the worst month in history." This plant is down to a single shift for the first time in seven years, and its workforce is cut 40%. Most reporting stamping firms are geared closely, however, to the hard-hit auto industry.

Metalworking firms are reportedly buying cutting tools from hand to mouth, and are not stocking up on inventories. Cutting tool sales dropped off materially in the first two months of this year from January-February 1957 levels, and most shops are on a four-day week at best.

Steel operations across the country have fallen off considerably to a national average of 52.5% of rated capacity, with some areas down as low as 29%. Biggest hope of the steel producers is a boom in residential construction.

Sales of major domestic appliances are running about 15% behind last year's. Some producers expect a 10-12% pickup in April or May, others say it won't come until the fall.



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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

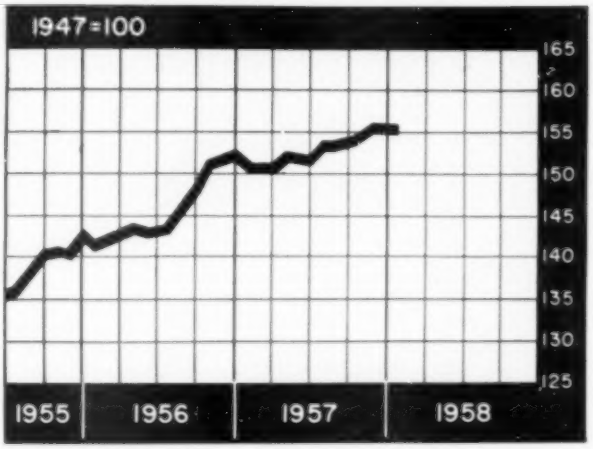
	FEB. Estimated	JAN. Preliminary	DEC. Revised	JAN. Year Ago
Total Index	**158**	**160**	**164**	**180**
Machinery	133	136	156	
Electrical Machinery	186	189	207	
Autos	120	136	146	
Other Transportation	329	312	352	
Other Metalworking	135	141	143	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	FEB. Estimated	JAN. Preliminary	DEC. Revised	JAN. Year Ago
Total Index	**156.2**	**156.2**	**156.2**	**151.1**
Metalworking Machinery	183.0	183.0	174.5	
Other Machinery exc. Electrical	166 5	166.4	159.7	
Electrical Machinery	157.4	157.1	152.0	
Fabricated Metal Products	146.6	146.8	143.1	

156.2



Consumer spending high despite recession...

Despite the recession, consumer income and spending have held up well. Both have dropped only about 1% from their record highs last summer.

And Americans will go on spending at high levels during the downturn as wage hikes and jobless pay offset income losses due to unemployment.

But consumer spending in one sector—durable goods—has declined sharply. And the prospects for a pickup in the near future are dim.

Tax cuts and price cuts would doubtless provide some stimulus to durables sales. The recent rush to buy small appliances when Fair Trade prices were slashed shows that consumers still have the will and the wealth to snatch up a bargain.

But on the big items—cars, TV sets, refrigerators and the like—credit remains the key. About 2/3 of the buyers of new cars use credit, and the same holds true for about half the people purchasing furniture and big-ticket appliances.

Consequently, when consumers are reluctant to take on debt, durables sales lag. Such is the case now as flagging confidence reduces consumer willingness to buy on time.

Statistics indicate that people are shying away from installment debt. Installment credit extended in January fell—on a seasonally adjusted basis—$100 million, or 3%, from December. And auto paper extended declined (seasonally adjusted) 5% from December's total of $1.4 billion.

More than any other consumer expenditures, outlays on durables exert leverage on the economy as a whole, stimulating many key industries—steel, metalworking, etc. Thus, as long as durable goods sales remain slack, consumer spending cannot be expected to spark economic recovery.

When the economy perks up, so will durables sales. Given the present state of consumer morale, it's not apt to work the other way round.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	126.7	128.4	148.3
Steel ingot production (thousand tons)	1,442	1,425	2,401
Electric power output (million Kilowatt hours)	11,793	11,803	11,867
Production of automobiles and trucks	108,155	117,471	169,053
Engineering construction awards (Eng. News-Record, millions)	$313.1	$365.1	$412.3

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Durable goods manufacturers' sales, millions*	$12,639	$13,092	$14,941
Machinery manufacturers' sales, millions*	$ 3,846	$ 3,954	$ 4,342
Durable goods manufacturers' new orders, millions	$10,576	$11,399	$14,176
Machinery manufacturers' new orders, millions	$ 3,274	$ 3,422	$ 4,246

* Seasonally adjusted

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In Repairing — Specially designed equipment handles flattening, straightening, tensioning, riveting, and finish grinding.

In Re-segmenting — Specialists using the latest techniques and machines have the know-how to do any re-segmenting job quickly to your complete satisfaction.

For complete Segmental Saw Service send your saws to any of these Simonds Factory Branches: 1350 Columbia Road, Boston, Mass. • Hawn Ave. and Simonds Drive, Shreveport, La. • 3323 West Addison St., Chicago, Ill. • 228 First St., San Francisco, Calif. • 6500 N.E. Halsey St., Portland, Oregon.

NOTE: Simonds Segmental Saws (either tongued or slotted type) are made of tough shock-resistant alloy steel saw plate with accurately fitted High Speed Steel toothed segments securely riveted to the rim. Saws are also available with carbide tipped segments for cutting aluminum and magnesium.

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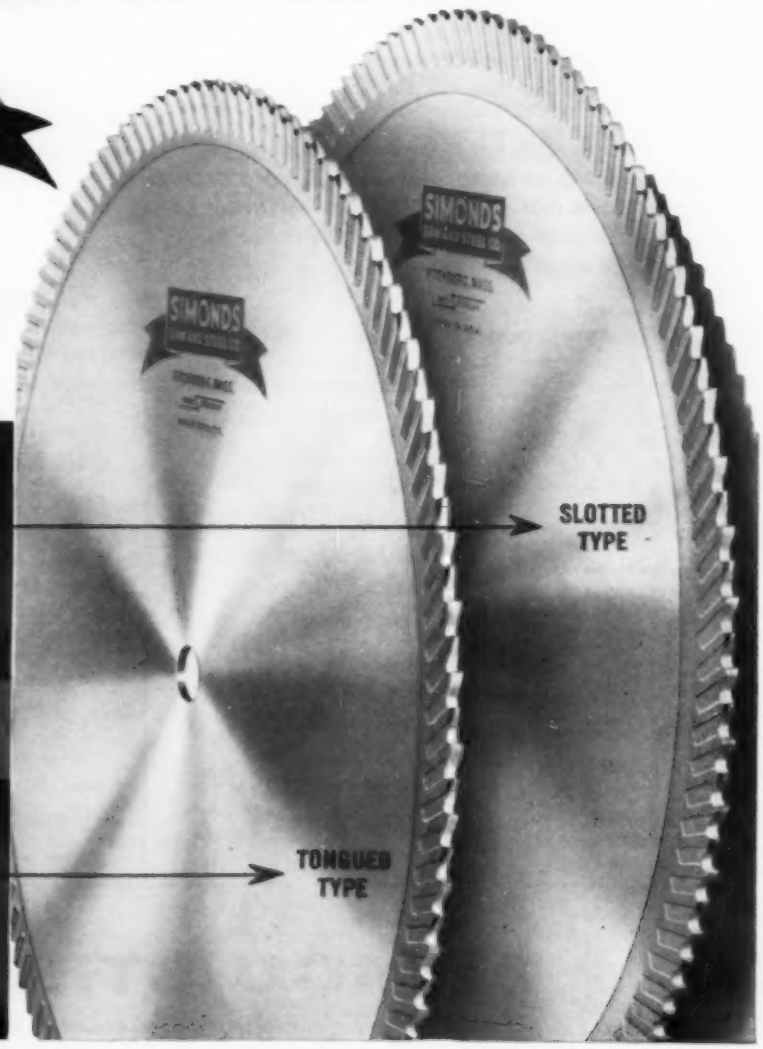

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon, Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

Armco 17 Stainless Steel Sheets Now Cost 20% Less Than Type 302

In Many Applications, Type 430 delivers the most for the least

If you now use chromium-nickel stainless steels in products that don't come in contact with corrosive chemicals, sea water, or salt air, there's a chance that economical Armco 17 (Type 430) Stainless Steel can bring you substantial savings.

Today, for example, the price base of Armco 17 (17% chromium) Stainless Steel sheets is about 20 per cent less than that of Type 302. That's a saving of 11¼ cents a pound—$225 a ton! The reason is that Armco 17 contains no costly nickel.

Ideal for many products

If you have hesitated to specify chromium-nickel stainless steels for your products because of cost, it may pay you to investigate economical Armco 17.

Typical examples of products that can be improved with this low-cost stainless steel include architectural trim, appliance parts, tableware, counter tops, hospital equipment, sinks and drainboards. In addition, its resistance to heat scaling and strength at high temperatures have made it ideal for heat exchanger parts, combustion chambers, and similar items.

Mail the Coupon for Details

Armco 17 Stainless is readily available in both sheet and strip. Why not check to see if this economical stainless steel is suitable for *your* products? It is also supplied in bar, wire and billets—at lower cost too. Just fill in and mail the coupon for complete information. There's no obligation.

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Road Block To Cost Reduction

When is Washington going to remove one of the major road blocks leading to lower manufacturing costs in industry?

That road block is Bulletin F of the Internal Revenue Service. Bulletin F has kept alive for many years a totally unrealistic table of the estimated service life of production equipment for tax depreciation purposes.

The "useful life" . . .

. . . of machines and their sheer "physical life" are two entirely different things. One has little or no bearing on the other. But as long as the Internal Revenue Service, through Bulletin F, insists upon clinging to schedules much closer to the physical life than to the useful life of equipment, progress toward cost reduction in the metalworking industry will be severely retarded.

Congress, to be sure, recognized back in 1954 the necessity for doing something to encourage manufacturers to invest in new, more efficient, cost-cutting equipment. It passed a bill that permits machinery purchasers to write off their investments by the double-declining balance method or the sum-of-the-digits process.

This action was commendable. It legalized faster writeoffs. But it failed to correct one major defect in the existing system. The new methods of figuring depreciation still took as their starting points the outmoded 15-to-20 year lives specified in Bulletin F. So Congressional legislation accomplished only part of what it was intended to do.

No one familiar with the situation would be so bold as to say that every metalworking manufacturer will choose to take speedy tax writeoffs if these are permitted. Perhaps for good and sufficient reasons, many managements prefer a reasonably long depreciation period.

That is no sound argument, though, in behalf of penalizing thousands of companies that can justify the dollar outlay for new equipment only if they can recover their investment in three or five years, let's say. The production run of a particular product may be only three years. There is no point in buying machines that will greatly lower costs on that production run unless they can be written off in the same period.

Today's tax depreciation rules and policy make it extremely difficult, in fact virtually impossible, for the buyer to secure rapid depreciation on that kind of a deal. The burden of proof is on him. He is on the spot. And unless he is a courageous fighter and will stand up to the taxing authority, Bulletin F will prove his nemesis.

There is a saying . . .

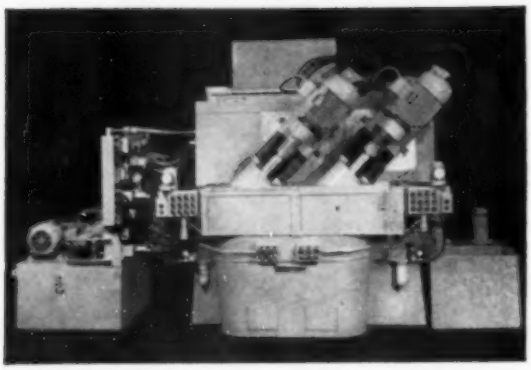
. . . that as capital goods go, so goes the economy. And today the investment in capital goods, for both expansion of facilities and replacement of obsolete equipment, is way off. And the national economy is off. Yet hundreds of potential equipment purchases are being held up until the top financial men think the time is right to buy.

Abolition of Bulletin F would help tremendously to remove this road block. The time is long overdue when the federal Treasury department should make it standard practice for its revenue agents to accept the proved useful life of equipment for tax depreciation purposes. Not until this practice prevails will metalworking management be able to take full advantage of the newly-designed cost-saving equipment available to them.

Burnham Finney EDITOR

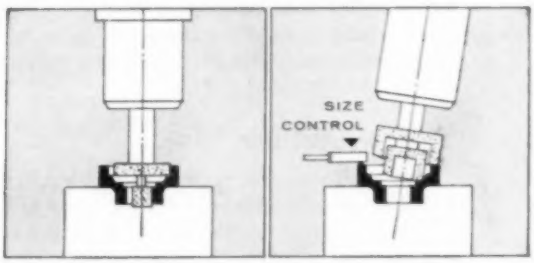
Vertical grinding reduces setups

SPRINGFIELD



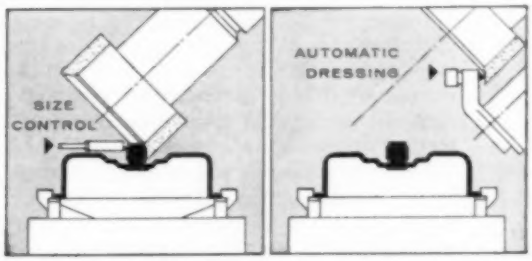
One head grinds while the other retracts for dressing, unloading and loading.

The double spindle Springfield vertical grinder in the photo is typical of vertical grinders automotive production men are using to 1) reduce setups, 2) improve grinding productivity, and 3) save floor space.



Transmission sun gear, 4 surfaces ground in 2 operations.

Two double spindle vertical grinders grind 330 gears per hour. Size control and wheel dressing are accomplished automatically. Typical machine cycle shown below.



Transmission housing hub, 1.-form grinding with automatic size control; 2.-spindle retracted for automatic dressing while operator unloads machine.

When part requirements change, only dresser, fixtures and sizing devices change—the machine itself has a long production life because heads can be repositioned easily.

Springfield special vertical grinders, with any desired degree of automation, pay for themselves in two years or less on long runs; standard Springfield vertical grinders pay off rapidly in large toolrooms and job shops.

We'd like to discuss with you the principle of vertical grinding, vertical contour grinding, and subsequent cost savings. Please send today for illustrated Bulletin 197-B. The Springfield Machine Tool Company, Springfield, O.

NEWS REPORT...

Capital Spending May Drop $5 Billion But '58 Will Still Be Third Biggest Year

WASHINGTON—One of the reasons why the business recession is going the way it is became clear to Washington's politicians and the country's businessmen this week. The reason is spelled out in the table on this page: businessmen have been cutting back substantially on their plans for expansion—cutting back on spending for new plant and new equipment.

What it all ads up to is that spending for this key prop to the economy is going to be $5 billion less this year than in 1957—assuming that businesses follow the expectations they reported to the Commerce Department and SEC since the first of the year.

The most important signs for the metalworking industry are that businessmen overall see themselves spending 13% less than last year—and that manufacturing industry expects a 17% decline.

But not all the highlights are gloomy:

- The decline is a slow one, with no sign that businessmen are calling a halt to all expansion.
- This year's estimate of spending is still huge by any standard—the third largest ever, coming below only the super-boom plant and equipment expansion of 1957 and 1956.
- There are signs from some key industries that the reduced spending may be over by mid-year, and may start up again.

First All-Year Survey

The survey—based on returns gathered largely in February by the Commerce Department and the Security Exchange Commission—is the first government effort to measure plant and equipment spending for the whole year. Last November, a McGraw-Hill survey showed business was planning a 7% reduction for 1958. The two surveys are not comparable — Commerce-SEC, for example, covers more small businesses. But the 7% decrease indicated last November, compared to the 13% drop in the new survey, can be taken as a rough indication.

Another, and more direct indication, is a decline in expectations regarding the current quarter—as reported three months ago and in the new survey. In December, the Commerce-SEC survey reported business plans to spend at a seasonally adjusted annual rate of $35.5 billion this quarter. The new indication is for a rate of $34.0 billion.

For the year as a whole compared to 1957, every major classification of industry but one seems headed for a drop.

The exception is public utilities—long a star performer in these surveys. Some $6.4 billion of new capacity will be put in place this year if utility executives carry through with their plans—up 4% over 1957.

Here is the trend for the other major groups: Durable Goods Manufacturing, down 22%; Nondurable Manufacturing, down 12%; Mining, down 15%; Railroads, down 38%; Other Transportation, down 19%; Commercial, Communication and other, down 12%.

When the returns are put on an adjusted basis and translated to annual rates, the deliberate pace of the slide-off becomes more apparent.

In durable goods manufacturing, for example, the investment boom hit a peak of $8.3 billion in the second quarter of 1957. It has been sliding since, and for the first quarter of this year is expected to be $6.8 billion (seasonally adjusted annual rate). In the second quarter, the indication is for $6.2 billion.

Railroad investment is in a sharp slide-off. It peaked out in the third quarter of 1957 at a rate of $1.5 billion, is dropping to $1.1 billion this quarter and is expected to sag to $840 million next quarter.

The adjusted annual rate for transportation (other than rail)—with aviation in the key role—kept growing to a high of $1.9 billion in the fourth quarter of 1957. It's heading down to $1.7 billion this quarter, and to $1.3 billion next quarter.

New plant and equipment spending 1957-58

			1957				1958	
	1957	1958*	Jan-Mar	Apr-June	July-Sept	Oct-Dec	Jan-Mar	Apr-June*
MANUFACTURING	15,959	13,196	3505	4183	4010	4261	3466	3319
Durable-goods industries	8022	6225	1759	2120	1995	2148	1707	1575
Primary iron and steel	1722	1266	327	437	452	506	367	327
Primary nonferrous metals	814	470	147	217	223	227	177	122
Electrical machinery & equipment	599	563	126	152	145	176	129	144
Machinery (exc. electrical)	1275	1178	270	317	308	380	313	289
Motor vehicles, equipment	1058	768	297	314	252	195	180	198
Transportation equipment (excluding motor vehicles)	544	460	126	150	130	138	124	104
Stone, clay & glass	572	448	135	156	139	142	115	114
Other durable goods	1438	1072	331	377	346	384	302	277
Nondurable-goods industries	7937	6971	1746	2063	2015	2113	1759	1744
Food and beverages	850	763	201	225	209	215	190	190
Textile mill products	408	252	111	114	93	90	72	60
Paper & allied products	811	622	192	216	206	197	170	156
Chemicals, allied products	1724	1621	353	435	440	496	428	415
Petroleum & coal products	3453	3106	728	892	894	939	744	784
Rubber products	200	170	46	53	48	53	43	47
Other nondurable goods	491	437	115	128	125	123	112	92
Mining	1243	1058	300	327	314	302	270	284
Railroads	1396	868	342	362	358	334	298	225
Transportation (other than rail)	1771	1440	358	478	447	488	407	336
Public utilities	6195	6414	1205	1510	1720	1760	1466	1723
Communications	3032	9098	725	797	728	782	2327	2536
Commercial and other	7366		1847	1933	1780	1806		
Total	36,962	32,074	8282	9590	9357	9733	8234	8423

* Estimated

NEWS REPORT...

First US Tape-Controlled Line Goes Into Production at Hughes-El Segundo

LOS ANGELES — America's first tape-controlled line of machine tools was demonstrated here March 11 jointly by Hughes Aircraft Co and Kearney & Trecker Corp of Milwaukee.

The line consists of a milling machine, a drilling machine and one for boring—all linked together by punched tapes and electronically controlled by transistorized digital computers. Hughes' digitally controlled prototype line is currently fabricating parts on a production-line basis for the company's El Segundo, Calif, plant, where airborne armament control systems for jet interceptors are made.

Most significant aspect of the new line is its ability to run different parts through various operations simultaneously. Any quantity of different parts can be intermixed during a single run— and the tape retains production information for future needs.

Hughes' digital control system requires no coded conversion, and no computer is necessary. Because "Digitape" is based on a straight decimal system, blueprint drawing information can be translated into acceptable machined parts: (1) from a planner who uses existing drawings to prepare a planning sheet and machining fixture, (2) to a clerk who makes a punched tape from the planning sheet, (3) to a tape reader, and (4) to the line that automatically machines several different parts at once.

First machine in the line is the miller, which is so arranged that the head can move in three axes while the work remains stationary (except for rotary movement in 360° on a pallet). Feed and speed are controlled electronically in all axes, and the ways are clamped before cutting to insure a good surface finish.

Drilling machine, next in the line, has a magazine that holds 20 different sizes of drills and taps, reamers, counterborers and other tools. Each drill has its own bushing, which is extended as the drill is extended, eliminating need for drill boxes or plates for various parts.

Each tap has its own lead screw. This insures accurate thread cutting, and, when a drill or tap breaks, a safety device automatically retracts the tool.

The boring bar in the two-spindle boring machine is automatically set to proper dimensions by signals from the tape. Two spindles allow for boring of various ranges of holes, or allow for use of a milling cutter for greater versatility.

Hughes' integrated line is constructed on the "building block" principle (machines and controls are fitted together in blocks in any desired number and arrangement). The line can be added to, or rearranged, from time to time and still be capable of operation from a single tape for each part.

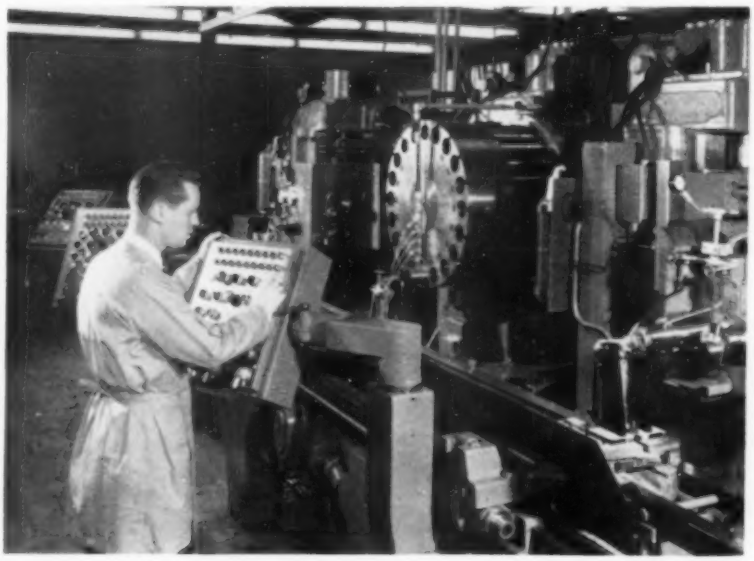
Four tapes, one on each machine and one on the transfer unit, operate the line. By inserting four different tapes in the three-machine line, Hughes can machine four entirely unrelated parts. One tape is required for each part at each machine, while the fourth tape allows a new part to be prepared at the ready station.

One of the most practical features of the line, insofar as tooling costs are concerned, is that only one workholding fixture is needed for each different part.

Thus machining of quantities of one type of part on the line requires four identical tapes—one for each machine, plus one for the transfer unit and the ready station, where a blank is prepared. Because of the relatively short setup time involved, a few parts in any sequence can be run through as inexpensively as several hundred.

Jigs and fixtures are eliminated on the line, and so is all material handling—by an automatic transfer mechanism. And while parts are manually loaded and unloaded, even this can be automated.

At Hughes' El Segundo plant, production of even a few hundred parts of one kind represents a large order. Up to now, "Detroit" style automation has not been practical because volume of production couldn't pay for it, but now the Digitape control system allows short runs of different parts to be made to uniform tolerances—and tooling changes, one of the aircraft industry's most common and expensive operations, are virtually eliminated.



Shot in the arm for U S missile output . . .
. . . is America's first tape-controlled production line. Line is made up of (from left) Kearney & Trecker milling, drilling and boring machines—all operated by new Digitape electronic controls at Hughes-El Segundo

$1.5-Billion Defense Boost on Way

WASHINGTON—The Pentagon was putting finishing touches on a supplemental appropriation request of at least $1.5 billion for fiscal 1959, as *American Machinist* went to press.

The sum will be tagged on to the $39.1-billion defense budget sent to Congress in January and will push next year's military expenditures over the $41 billion figure for the first time in six years. Before the supplemental appropriation request—the second in the current session of Congress—was considered, fiscal 1959 spending was expected to total $39.8 billion.

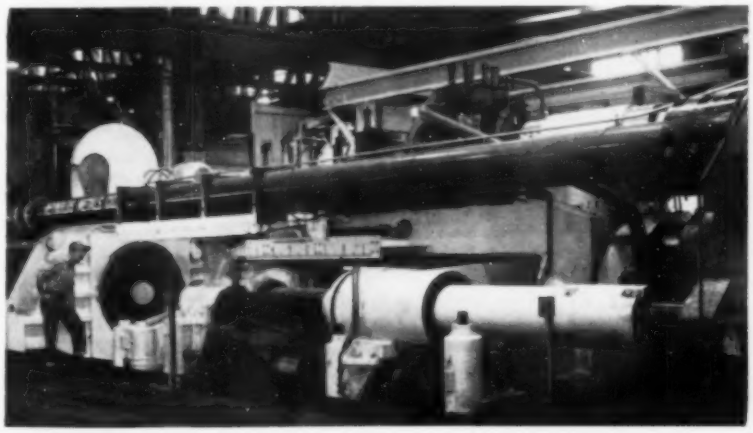
Exact amount of the second supplemental money request has not yet been fixed. The Pentagon is still debating what projects to beef up with the additional money. The claimants for extra cash are almost endless in number—for in putting together the current appropriation request, the administration slashed almost $10 billion from the Services' preliminary estimates of their money needs.

How It Will Be Spent

As it stacks up now, the request will probably include funds for these projects:

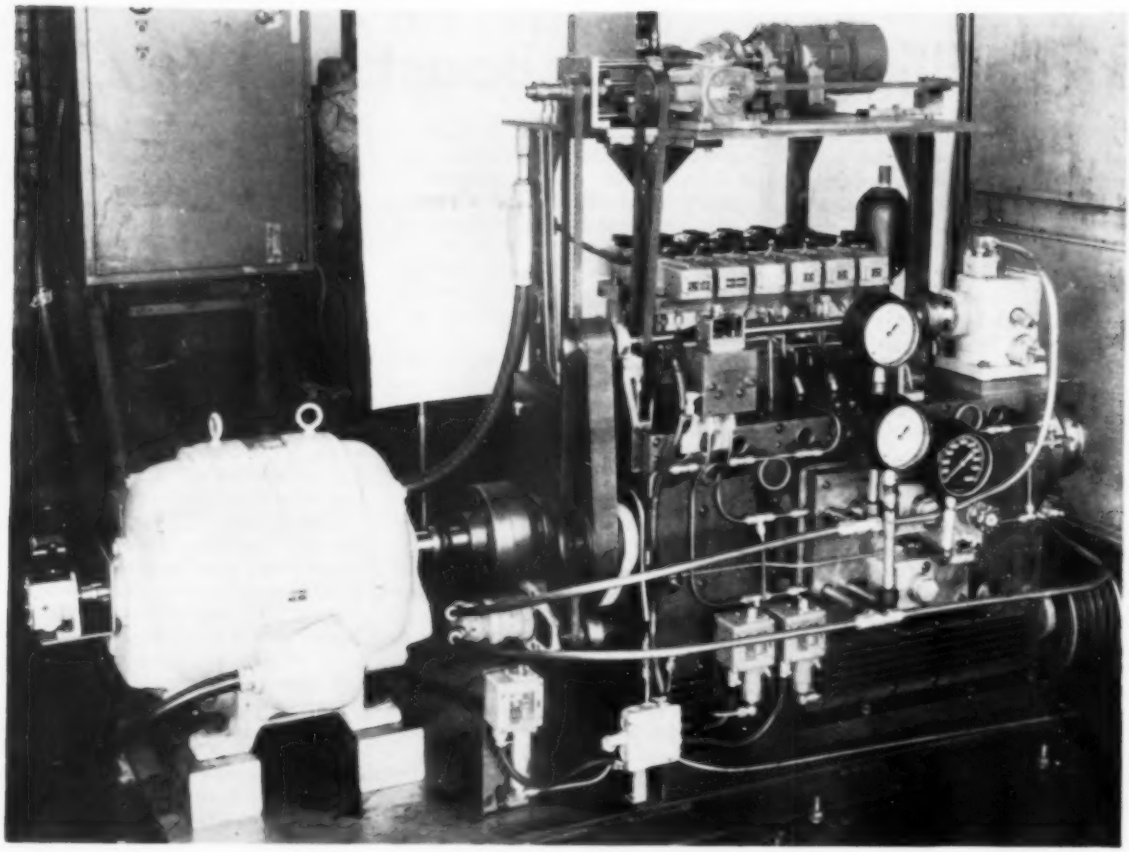
- Boeing's B-52 heavy bomber and KC-135 jet tanker. Under current schedules, production of both planes will halt by the end of 1959. Air Force planners, however, are clamoring for more aircraft to bolster the Strategic Air Command until ICBMs and supersonic manned bombers become operational in large volume. Supporting this plea is mounting political pressure to keep B-52 and KC-135 production workers on the jobs. A few weeks ago, for instance, Bell Aircraft, subcontractor on B-52 engine nacelles, warned that "several thousand" men will be laid off when the project ends.
- Construction of at least three $80-million atomic submarines armed with Polaris IRBM, and stepped-up production of the Lockheed missile. The Navy now has funds to build three vessels, has long-range plans for a fleet of at least 20 Polaris A-powered subs. The Navy argues strenuously that more funds for strategic attack forces should be earmarked to build up a mobile fleet of Polaris subs, less for construction of an Air Force network of "vulnerable" fixed ICBM installations.
- Development and launching of space vehicles and satellites. The recently organized Advanced Research Projects Agency has a stack of proposals from each of the Services for wide-ranging types of space projects—notably rockets to the moon, reconnaissance satellites, and manned flight in so-called "boost-glide" rocket vehicles. Right now, space development work is limited mostly to the Air Force's Lockheed "Pied Piper" recon satellite, IGY research projects, and early development of very high-thrust, single-chamber rocket engines.
- The Air Force's "Minuteman" solid-propellant ICBM. The Air Force is now selecting a weapon system contractor to direct development of this new project. Several companies—among them Aerojet-General, Thiokol Chemical, Grand Central Rocket, and Phillips Petroleum—are competing for the propulsion system.
- The Air Force's Martin Titan ICBM—with special emphasis on research for liquid propellants more easily handled and stored than the liquid oxygen now used as an oxidizer in long-range rockets.
- The Bell Telephone Labs-Douglas Aircraft Nike Zeus anti-missile missile. Funds for development of the system—carried up to now on the Army budget—have been sorely limited. But last month, the defense Dept cancelled the Air Force's competing RCA-Convair Wizard system, placed Nike Zeus under ARPA's direction, and hinted strongly that Nike Zeus development will be pushed vigorously. RCA's electronic work in Wizard, the most critical part of the system, is being continued in competition with Bell.

Also under study for inclusion in the supplemental appropriation request—but rated less likely to benefit—are proposals to extend production of the Air Force's Northrop Snark 5000-mile subsonic cruise missile; to reinstate production orders for tactical fighters, transport, and fighter-interceptor aircraft, stretched out or cut back during last spring's defense economy drive; and to increase procurement of advanced types of tanks, small arms, and other conventional weapons for ground troops.



6000-ton extrusion press for Reynolds

This 6000-ton extrusion press, largest in Arizona and one of the largest owned by the Navy has just been installed at Reynolds Metals Co's Phoenix plant, where it will extrude aircraft shapes and other defense materials for the Navy. Designed and built by Loewy-Hydropress, the press can switch from working nonferrous metals to extrusion of steel and titanium at the touch of a button, and containers can be changed in 20 to 30 minutes. Press also has an independent mandrel mover which can be stopped independently from the press movement to allow extrusion of shapes of unusual design, such as small, hollow configurations. Press also can handle split dies for step extrusion



Smart engineering solves an old problem...

At Last! An adjustable-speed drive gives any range at constant hp

By WILLIAM M STOCKER, JR, associate editor

BRIDGEPORT, CONN — Design an infinitely adjustable-speed drive that will maintain constant horsepower through a 13.5 to 1 range? Many people have said it couldn't be done with a mechanical system. But Bullard Co's president and engineers have found the answer. Put into practice, this ingenious solution exceeds the inventors' best hopes.

Using a combination of planetary differentials and two small, positive displacement hydraulic units, Bullard's new transmission provides constant torque from 1 to 130 rpm, constant horsepower from 130 to 1800 rpm, and the speed is infinitely adjustable, throughout the range, without interruptions or steps. Potential applications? Machine tools, process machinery, and such heavy transportation equipment as tractors, earth movers, tanks, locomotives, and ships.

With this design, speed control is available in either direction from zero—and full torque is available from the zero position. Also, the design permits assembly of units to provide smaller ranges. Ranges of 3 to 1 or 6 to 1, for example, are provided by slight modification.

Power transmission problems are creating a continually increasing challenge to engineers in every industry. The race to find an answer that offers wide-range, constant-hp speed control has concentrated largely on frictional, electrical and electronic methods, leaving mechanical techniques far behind in the dust. Engineers believed that it was seldom practical to use mechanical ratios, for constant horsepower, that exceeded three or four to one.

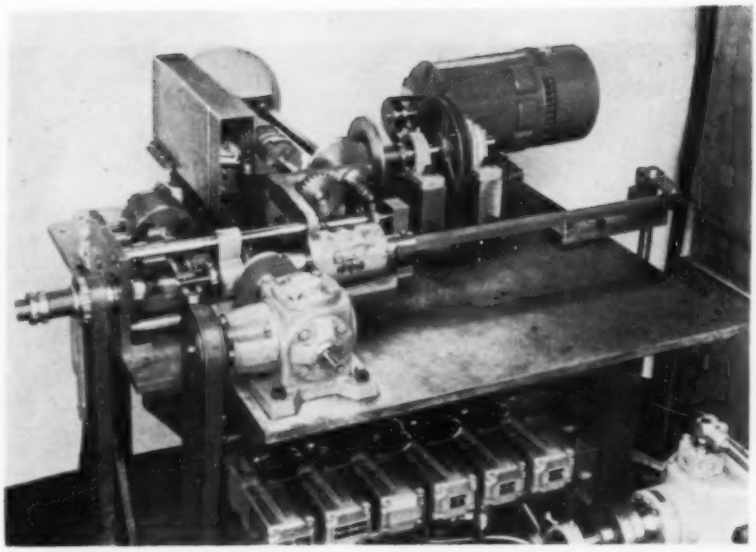
Major Tests Passed

These foregone conclusions go out the window in the face of this Bullard development. While not yet ready for commercial application, the prototype drive has passed all of its tests with flying colors. Now the

company is refining the control system and designing the "package."

For testing, the drive is hooked into a vertical turret lathe. This prototype is designed to transmit 40 hp and provides a smooth transition from 0 to 1800 rpm. In one test, the face of a large-diameter steel part was machined from perimeter to center with a constant surface feed and constant horsepower.

With the motor running and the drive engaged, and with a carbide tool in the cut, the drive was shifted to zero speed, then rapidly shifted again to 300 sfpm. The cut was continued with no damage to the tool. Similarly, extended overload tests up to 75 hp showed no damage to the transmission. From the no-load condition to full load, even with instant loading, there is no perceptible drop in rpm.



Temporary controls . . .
are electro-mechanical, but commercial drives will have hydro-mechanical controls with a minimum of electrical equipment. Hydraulic servo maintains balance between clutches and planetaries

Here's the Principle

The principle of operation of the new drive includes the combining of planetary differentials with two small size positive displacement hydraulic units. The heart of the drive comprises two planetary differentials that are so inter-connected that during the operation of one, the other is pre-conditioned to take over where the first left off, and vice-versa.

While a drive can be built employing this nucleus, the 40 hp prototype employs two additional planetary differentials which are connected to the heart of the drive so that one transmits two separate ranges of speed to the output shaft and the other transmits a third range of speed to the output shaft.

Hydraulic Clutches Transfer Power

Hydraulically-operated clutches are employed in the drive, and they are operated sequentially in various combinations to transfer the flow of power between all of the planetary differentials. The design of the gearing within the drive is such that infinitely adjustable speeds of the output shaft are produced with no noticeable output speed drop or even a distinct plateau through the entire range of speed from 0 to 1800 rpm.

Clutch-Shifting System

Sequential shifting of the clutches is controlled by a system that insures the engagement of a power-transferring clutch prior to the disengagement of the clutch from which the power is transferred. Furthermore all clutch shifting operations take place at synchronous speed and the engaged clutch always unloads the clutch to be disengaged.

A servo mechanism is employed in the control system to insure at all times a positive speed relationship between the hydraulic units and the planetary differentials to provide the synchronous speed for clutch shifting.

E P Bullard, III, developed this concept of differential planetaries and hydraulic clutch actuation in seeking a better mechanical drive for his company's machine tools. In addition to being president of Bullard, he is an outstanding engineer.

87-92% Operating Efficiency

Extensive Prony-brake tests show an operating efficiency of from 87 to 92% for the 40-hp prototype in the full range from zero to 1800 rpm. Further tests have determined that, in this complex servo system, only 6% of the horsepower is absorbed in the hydraulic system. In fact, during most of the operating time the hydraulic unit is used to only 25% of its capacity.

Present efforts, prior to building a commercial model, are devoted to developing a suitable "package" or housing and to refining the control system. (The commercial unit will be no larger than other adjustable-speed drives of comparable horsepower and will offer a much wider range at constant horsepower.)

For developmental purposes, an electro-mechanical control system having solenoid-actuated valves was used for clutch actuation. Bullard engineers are developing a purely hydro-mechanical control system which will require a minimum of electrical equipment and will be mounted within the drive housing.

It's Easily Repaired

Results with the prototype to date show the design to be sound and indicate inherent reliability. Furthermore, the techniques of construction are standard so that any good mechanic should be able to repair the drive with very little instruction.

Plans are to build first commercial models, following those units released for test, right into the present headstock on Bullard's vertical turret lathes and/or horizontal boring mills. This control of power added to the versatility of speed will give tremendous production advantages. Also, this gearing concept suggests numerical control possibilities based on hydro-mechanical, rather than electronic, equipment.

But the really big markets, the startling possibilities, are in the field of transportation, as a new transmission for trucks, tractors, buses, trains, and boats.

Dual-rotation unit shaves Ti, stainless rivet heads

Dual-rotation rivet shaver has been developed by Boeing-Seattle to meet needs of modern aircraft. Finding that conventional end mills just can't shave the heads of titanium and stainless rivets satisfactorily, the Boeing people came up with this unit, which has a standard 1-in. arbor, tungsten-carbide rotary file that moves in two axes. Reason for the two axes: a rotary file moving in one axis does a good shaving job, but it leaves an unsatisfactory finish. File is driven at 4180 rpm by a ¼-in. portable air-drill motor, has an adjustable threaded housing that controls the closeness of the shave—essential in aerodynamic smoothness, which demands a protrusion of less than 0.002 in. In tests, more than 1000 titanium-alloy fasteners were shaved before the file required resharpening. Boeing is patenting it, selling rights to an outside manufacturer

Rule US-Owned Plants Taxable

WASHINGTON—State and local tax authorities around the country will soon be tapping a revenue bonanza created for them by the U S Supreme Court. Metalworking companies are among those most affected.

Under three cases decided March 3 by the Court, billions of dollars of federally-owned property—up to now considered constitutionally exempt from state taxation in most quarters, at least—is now fair game for state legislatures and local tax authorities.

Work in Progress, Too!

If the broadest implications of the decisions are borne out—as now seems certain—it means non-federal taxing authorities can charge defense contractors a tax on government-owned work in progress. And they can levy a real property tax on any businessman using federally-owned buildings while working on either government contracts or private business.

Because most states will only now get on the bandwagon, it is impossible to measure full impact of the new rulings, which say in effect:

- All government-owned plants leased or used by private companies are subject to state or local real property taxes at full value, payable by the companies and . . .
- All government-owned materials —raw materials, work in process, parts, durable and non-durable tools, and inventories—in the hands of government contractors are subject to state or local personal property taxes, payable by the contractor.

Actual assessment of taxes is made against the firm leasing or using a government plant or using government materials. But there is no doubt most of the financial burden will be shifted to the federal government. That is why the federal government joined companies fighting such taxes. And that is why, too, the state victory on the issue is a reversal of the old principle that federal property is generally immune from state taxation.

Estimates of the total cost to the government are hard to come by. One guess has Defense Dept procurement costs up $250 million a year, just to cover new local personal property taxes assessed on government-owned materials in the hands of defense contractors.

Los Angeles County, has been collecting $20 million a year from defense contractors through a personal property tax similar to the one just approved by the Supreme Court. Nationwide, the Budget Bureau estimated federally-owned materials in the hands of contractors in 1953 totalled $4 billion. Last year the figure was $2.8 billion for Air Force procurement alone.

Impact Hard to Measure

It is as difficult to measure impact of real property taxes on government plants leased or used by private companies. In defense work, the percentage of government-owned plants is high. For example, two-thirds of the plant facilities used by the 12 major aircraft companies are owned by the government. The Supreme Court says such plants can be taxed by the states at full value—not just at the lesser value of the firm's lease or use of the plant.

Need for More Manhour Output to Fight Profits Squeeze May Bolster Machine Tool Sales

NEW ORLEANS—Dire need of metalworking companies to secure more output per manhour as a result of the price-cost-profit squeeze will help the machine tool industry to recover from its current low level of business. Therein lies the greatest potential for new machine tool business this year.

This opinion was voiced at the 34th spring meeting of the American Machine Tool Distributors' Association at the Hotel Roosevelt March 10-11. Frank H Habicht, Association president and president of Marshall & Huschart Machinery Co, Chicago, reported a feeling of cautious optimism among distributors and customers. He predicted that net new machine tool orders in 1958 probably will exceed the 1957 total, despite a slow start. Many new plant and expansion programs on the drawing boards will be quickly released as capital funds become more available.

Long-Term Outlook Good

The long-term outlook is for greater demand for machine tools and a further increase in capacity for building them, Mr Habicht said. "The time is not far off when $1 billion of sales will be considered a normal peacetime year for machine tools." If the Gross National Product continues to expand as predicted, nearly $2 billion of machine tools will be needed each year by 1970.

With the theme "Sound Management Means More Sales," the Association conducted a series of forums covering such areas as sales and service, administrative management, manufacturers' relations, and problems of multiple-line houses. The problems brought up at these forums will be studied further by the Association, I B Rabel, Star Machinery Co, Seattle, chairman of the AMTDA Management Committee, disclosed.

AMTDA Nameplate

The Association has created a nameplate to be placed on every new U S machine tool that its members sell, J O Ellison, first vice president of the Association and president of Harron, Richard & McCone Co of Northern California, told the members. This nameplate recognizes that our "standard of living is made in America on machine tools." It will say that "This machine was made in America and sold by a member of the American Machine Tool Distributors' Association." Mr Ellison reported as chairman of the Public Relations Committee.

National Machine Tool Builders' Association is strongly in favor of establishing sound trade agreements with foreign countries, provided they are mutually beneficial, but is opposed to reciprocal trade agreements "where we are swapping horses for horse chestnuts," Ludlow (Pete) King, NMTBA executive vice president, told the members. He pointed out that "as long as foreign countries restrict or prohibit their industries from buying U S machine tools, we could lower our respective import rates to zero and still end up with an agreement which would pour foreign machine tools into our country but would not sell one additional U S machine abroad."

Mr King cited a foreign bid of $112,000 on 31 24-in. shapers to be bought soon by the Air Force, as against an average price of about $300,000 quoted by six U S builders. "Our real concern is the amount of employment displaced" if the Air Force should buy these machines abroad.

The exodus of U S machine tool builders to foreign countries is deplorable, Mr King emphasized. The plants built abroad "do not strengthen our country, do not provide work for the 30,000 unemployed machine tool workers in this country, do not provide our government with taxes and, above all, cannot help defend this country in case of an emergency." The government should do everything possible to change the conditions "which practically force our builders to locate abroad."

"We have the highest regard and respect for our allies and friendly nations, for our many individual friends within those nations and for their respective machine tool industries," Mr King said. "To retain their friendship and respect, however, we must remain the greatest

America's oldest lathe

Winner of AMTDA's contest to find the oldest lathe in America is this 102-year-old, still doing general repair work in a shop owned by Weston L Haseltine of Baraboo, Wis. Original bearings were cast iron, with a single spindle. Carriage holddown is a 100-lb weight suspended between bedways, and bed and frame are of bolted construction. Although it was motorized in 1940, it is believed this granddaddy of all U S lathes was once operated by both water and steam power when it was used in a furniture factory and later in a hub-and-spoke factory. A Baraboo Indian claims the lathe was around when his great grandfather lived there in 1838. Its maker is unknown

AMTDA (continued)

military power in the world and be fully capable of protecting them against an all-out advance of Communism."

Shipments of cutting-type machine tools in 1958 should total $350 to $400 million, based on new orders the past five months, Mr King said. This compares with $843 million in 1957. It now appears that the low point was reached in December.

Successful launching of the "Explorer" would still be only a hope without the support and ingenuity of the machine tool industry, Louis L Gober, chief of engineering branch, industrial operations division, Army Ballistics Missile agency, Huntsville, Ala, told Association members. To date $33 million has been spent by prime and major contractors for procurement of facilities to support production of the Redstone and Jupiter ballistic missile systems alone, with about 20% going for production equipment and small tools, 48% for test equipment, and 32% for plant facilities. Biggest demand has been for lathes, jig borers, grinders, millers, drilling machines and machines for bending, forming and shearing.

Mr Gober stressed that the search is on for new materials to meet missile needs—stainless steel, nickel and titanium alloys, beryllium, ceramics and plastics, including fiberglass. This in turn will bring requirements for machine tools holding even closer tolerances.

Missiles like the Army's Nike, thanks to large numerical needs, lend themselves to certain automatic processes in production, whereas the small-volume Jupiter doesn't.

Equipment in the government's industrial reserves, with an acquisition value of $1 million, has been accepted by contractors for production of Army Ballistic Missile Agency programs. These machine tools are on the average six years old, Mr Gober revealed. Because of the close tolerances required for missile production, replacement of this equipment within the next one to three years is planned. Screening to date of machines from government reserves for the Army missile programs amounts to $8 million, based on acquisition value.

Selling government surplus machine tools abroad is an excellent idea, George Merryweather, chairman Government Relations Committee and vice president of Motch & Merryweather Machinery Co, Cleveland, reported. He expressed opposition to storage by the Armed Services of obsolete surplus machines, but predicted that the policy will be established of storing general-purpose tools in good condition.

He said that the Congressional bills for financing government machine tools replacements from rental money or machines leased to industry deserve support. He called attention to the experiment now being made by the Navy Bureau of Ships in a trade-in policy of old machine tools for new.

Press Control Improvements Lauded At PMI Meeting in Detroit

DETROIT—Progress in press design has taken a tremendous jump forward in the last few years, it was brought out at a panel meeting during the Pressed Metal Institute Conference here March 12-14.

Cited were such improvements as elimination of the open-type arch, with its exposed dragging mechanism. Today the dragging mechanism is inside the structure to give greater rigidity, easier maintenance, better lubrication.

Press controls today, too, are infinitely better than they were just a few years ago. Now, they allow use of progressive dies, and air counterbalances give better clutching action.

And complete automatic lubrication, either actuated by the machine or cycled by an electric motor, now allows press speeds to be increased, and adds to bearing life.

Final day's luncheon speaker was F R Widmer of Republic Steel Cleveland, who discussed "Planning for Tomorrow's Opportunities." The John Woodman Higgins Award was presented at the luncheon to Jack F Greathouse of Mack Trucks Inc, Plainfield, N J, for a changeover from cast aluminum manifolds to a new design stamped in halves from sheet steel. Carter H Higgins of Worcester Pressed Steel Co, who is the sponsor of the awards, made the presentation.

West's Biggest Lathe Plant for Brazil?

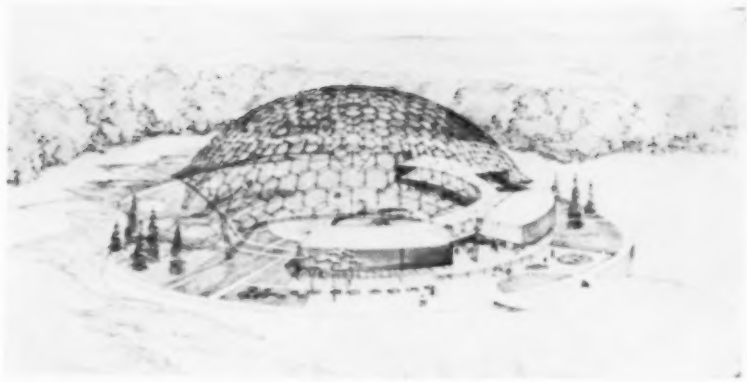
SAO PAULO, BRAZIL—What may well be the Free World's largest lathe plant is expected to be in operation here before the end of the year. The plant, which will be built by Maquinas Agricolas Romi S A, will turn out something like 5000 lathes a year. Some 45% of the plant's machine tools and equipment will be made in Brazil, the rest are on order from U S, British, German, Swiss and Italian manufacturers of capital goods.

The new lines will replace Romi's present ones, which the company considers obsolete, even though they are the mainstay of the South American lathe market. In fact, the present Romi lines turn out series of 350 lathes of several given types, contrasted with runs of 75 lathes maximum in most countries.

Because of Romi's huge proposed annual output, and under free trade conditions, it is expected that the Brazilian firm will soon be able to enter the export market with prices lower than those of most major industrial nations, including the United States.

Romi's new lines, which will be highly automated, will first produce a 1 meter sliding, surfacing and screwcutting lathe weighing 1300 kilos and with six spindle speeds up to 2000 rpm. Main drive will be from a 3 hp motor. Machine will have a 400 to 500 mm swing over the saddle and 590 to 690 mm over the bed.

Outside sources claim that even today Romi is producing lathes in almost 30% less working time than any equivalent plant in the West. And, it is estimated, when the new lines go into operation, total production time for any lathe will be only 25 to 28% of that required in any U S plant, and 20 to 25% of that in top European plants.



New home for ASM

This is how American Society for Metals' new national headquarters will look when it is completed in mid-1959. The $2-million building, to be erected east of Cleveland, will be dominated by the world's largest "space lattice" (all-metal geodesic dome). The building will be located on a rural, 100-acre site, "Metal Park," which will ultimately house some $20 million worth of science buildings. The new headquarters will include an engineering technical library, offices for ASM's headquarters staff of 90, dining rooms and service facilities. The entire structure will be surrounded by a garden-like atmosphere, and the court will even have a waterfall flowing into a pool

Wheelabrator Grants $100,000 Foundry Fellowships

CLEVELAND—Foundry Educational Foundation received a $100,000 educational grant from Wheelabrator Corp's Foundation here March 12, highlighting FEF's College-Industry Conference. The grant, too, marked Wheelabrator's 50th anniversary, and appropriately enough, is for 50 fellowships of $1500 each to be distributed during the next 10 years. The remainder of the grant can be used by FEF at its discretion for more fellowships, scholarships or educational purposes.

Applicants will be encouraged to take graduate work in engineering, science or business administration at FEF's 17 approved schools. But other fields and other schools are acceptable if the applicant can show that his studies will benefit the foundry industry. First recipients will begin their studies in the fall of this year.

Machine Tool Tariff Fight Is On

WASHINGTON — President Eisenhower should be given "clear authority to raise the tariff as high as necessary in the interests of national security," J Herbert Myers told the House Ways & Means Committee in hearings here in mid-March. Speaking on behalf of the National Machine Tool Builders' Association, Mr Myers added, "Let me say that the (machine tool) industry is not taking any position on the long-range advantages of reciprocal trade. Many machine tool builders have done and hope to do extensive business abroad."

But, he continued, there is a strong need to protect U S manufacturers from increasing foreign competition because the machine tool industry is "absolutely vital to the national security."

On these grounds, Mr Myers said the so-called "Defense Essentiality Procedure" of the Reciprocal Trade Agreements Act should be strengthened. This procedure gives ODM the power to recommend tariff boosts and cut import quotas when it finds imports are threatening domestic production needed for defense.

Mr Myers cited rising imports and decreasing exports of machine tools —plus the possibility of U S machine tool makers shipping their overseas branch plant production back to the domestic market—as reasons for tightening controls.

Imports, he said, have risen to 30% of domestic production, while exports have declined to 10% of that standard. Mr Myers predicted that domestic machine tool output will not exceed $400 million in 1958 —"This means that the industry will fall below the postwar 1946-1950 level . . . which we call the 'machine tool depression.'"

U S Employment Down 28%

Industry employment, he added, is down 28%, and many companies have gone on a 3-day workweek. Meanwhile, European import restrictions have remained higher than U S trade barriers, and European makers are taking full advantage of this and the price advantages they have in world competition—advantages even the 50% increase over 1930 tariff rates can't make up.

The other side of the liberal trade vs protectionist fight was given by George F Kohn, president of Precision Grinding Wheel Co, who stressed the importance of a liberal U S trade program, arguing Free World economic strength is "inseparable from domestic factors."

Domestic industries and segments that need trade protection, he said "are the few." "The many" are those who stand to benefit from expanded world trade.

The stepped-up Russian economic threat and establishment of the European Common Market underscore the need for a liberal trade program, Mr. Kohn said, adding that "Many of the alloys used in our metal manufacturing come from other countries" and represent the "sine qua non" without which many domestic industries can't exist.

And that's just about the way the battle shapes up—with some industries for higher tariffs, others for lower. The administration is currently trying to push through a bill that will cut tariffs, increase free trade. But at the same time, the administration is willing to add some protectionist amendments to the Bill in hopes of getting it passed in the face of tough opposition.

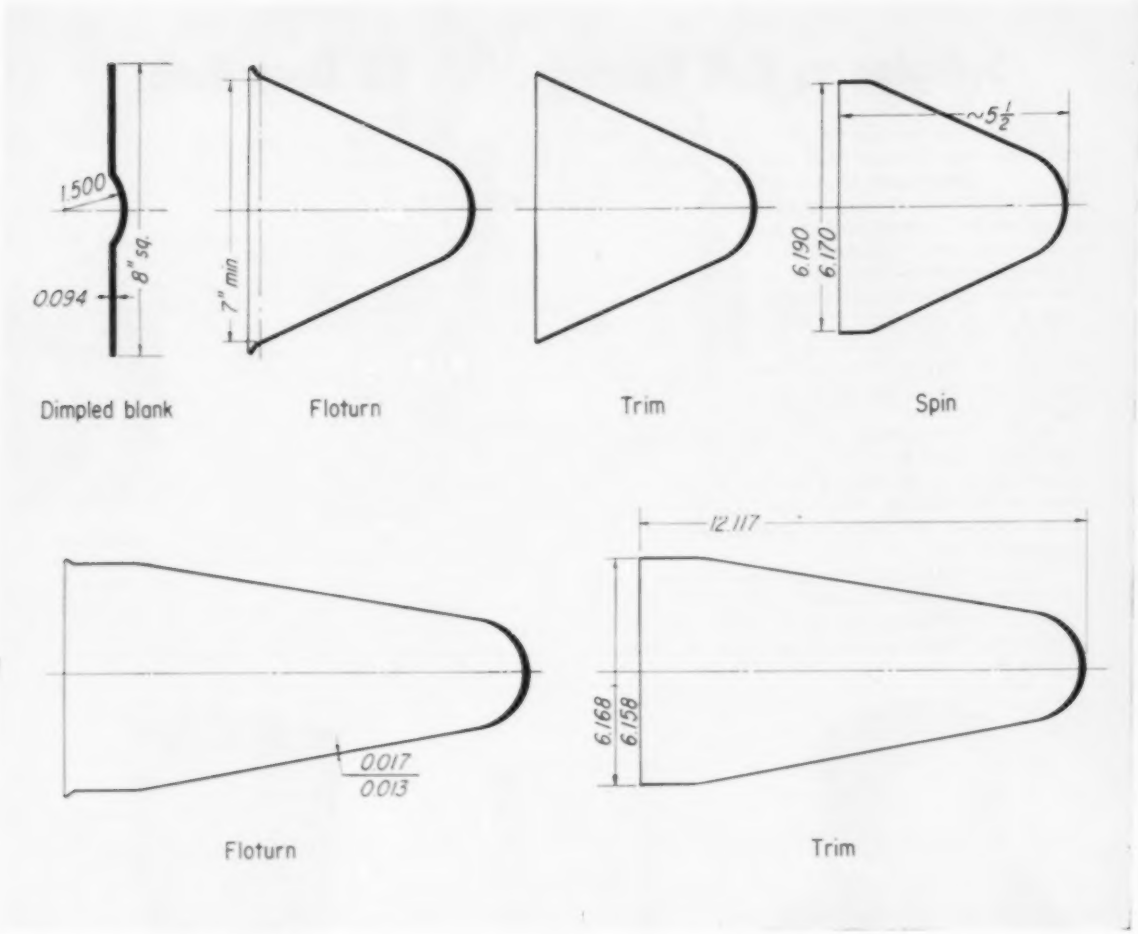
One possible compromise: set up a Federal Trade Adjustment Board to administer a stepped-up program of loans, tax benefits, unemployment compensation and worker training aids for those firms most likely to be injured by imports.

Explorer spotlights roll flowing

The first US satellite pierced Florida stratosphere with a roll-flowed nose cone of 430 stainless, bringing new attention to this recently developed metalworking process. Roll flowing shows signs of sharp future development, based on rigid requirements for thin-section developed metal shapes, as for missile and aircraft components. Here is a report on the latest; a pair of new high-powered machines, details on some recent jobs in both conventional and advanced materials, and results of laboratory tests that shed new light on basic techniques . . .

The Explorer nose cone (*AM*—Mar 10 '58, p 97) was actually a fairly simple job compared to others recently completed at Lodge & Shipley on Floturn equipment. One current example is a straight 3-in.-dia tube rolled in 310 stainless on limited-volume production. This was back-extruded (one of two basic roll-flowing processes) from a blank of seamless tubing 10 in. long, taken to a length of 40 in. The original tube wall of 0.150 in. was reduced in several passes of the hardened roller tool to 0.025 in. ±0.001 and round within 0.005 TIR.

The same shape has also been produced, for demonstration, in 446 stainless to a wall thickness of 0.015 in., and in molybdenum to a



Explorer nose cone starts . . .
as a press-dimpled blank of 0.094-in. 430 stainless. First roll flow shears down wall to 0.042-0.036 in., producing a preliminary cone. Anneal follows first trim to relieve stress. Spinning is required to produce a smooth break in the contour—actually a $\frac{5}{8}$-in. radius—and to form the cylindrical section. Second roll flow lengthens cone to final wall thickness. Final weight is 13 oz. Note that nose is still 0.094 in.

wall of 0.008 in. In each case the inside diameter of the original tube was unchanged, but the wall was extruded past the nose of the tool, flowing in the direction opposite to that of tool feed—hence the term "backward extruding."

Another current job at Lodge & Shipley is outer spikes for jet engines for the B-58 Hustler. This is the spear-like front cone that sits just inside the engine cowl to control air intake. Material is 5154 aluminum, starting with a press-drawn cupped blank with a wall of 0.081 in. First operation is to contour the major portion of the front cone shape (sketch p109) by roll flowing with a shearing action (the second basic roll-flowing process). The flat cup bottom is rolled sideways, like a deck of cards, to form a thinner angled conical wall 0.030 in. thick.

Then, with different speeds and feeds, several passes are taken over the remaining shoulder and cup wall to blend the front cone to the cylindrical section. Action here is more complicated than normal roll flowing, because the cupped blank is formed $\frac{1}{8}$ in. larger than the cylindrical diameter of the mandrel. This is necessary to provide sufficient metal to make a smooth radiused blend and to allow for complex cold working in the shoulder. Action is a combination of roll flowing and spinning (see explanation of the difference, p108).

Final operation is boring out the nose with a turning attachment.

NEW EQUIPMENT FOR LARGER PARTS

Latest development in the field is a new unit being built currently by Hufford Corp, Van Nuys, Calif, for Marquardt Aircraft (*AM*—Oct 7 '57 p 164). This is a large vertical machine built more on the lines of a press than of a conventional cutting machine tool. In contrast to Lodge & Shipley's Floturn (*AM*—Mar 29 '54, p 104) and Cincinnati Milling's Hydrospin (*AM*—May 9 '55 p 190), which exert about 50,000 lb of thrust in the toolslides and tailstock, the Hufford unit will have available 225,000 lb of thrust in each of two opposed toolsides and 200,000 lb of thrust in the vertical tailstock. Arrangement of the tailstock has been altered somewhat since the ma-

(CONTINUED ON PAGE 109)

Spinning vs Roll Flowing . . . . GE Does Both

Roll flowing is akin to, but not exactly like, spinning—the old-fashioned and still useful process. The apparently minor differences between these two cold-working techniques account for many of the difficulties that have cropped up in connection with roll flowing.

Spinning, either by hand or with a powered toolslide, consists of bending or flaring the metal into a new contour and often a new diameter. The wall thickness is not normally altered much. But roll flowing starts with a change in wall thickness, from which point a new contour can be formed. Diameter of the work remains the same.

Hand spinning takes great skill, a number of different shaped or roller tools, and patience. Power spinning can be applied only to simple contours because moving the metal into a new diameter, even though each particle moves only a slight amount, is difficult.

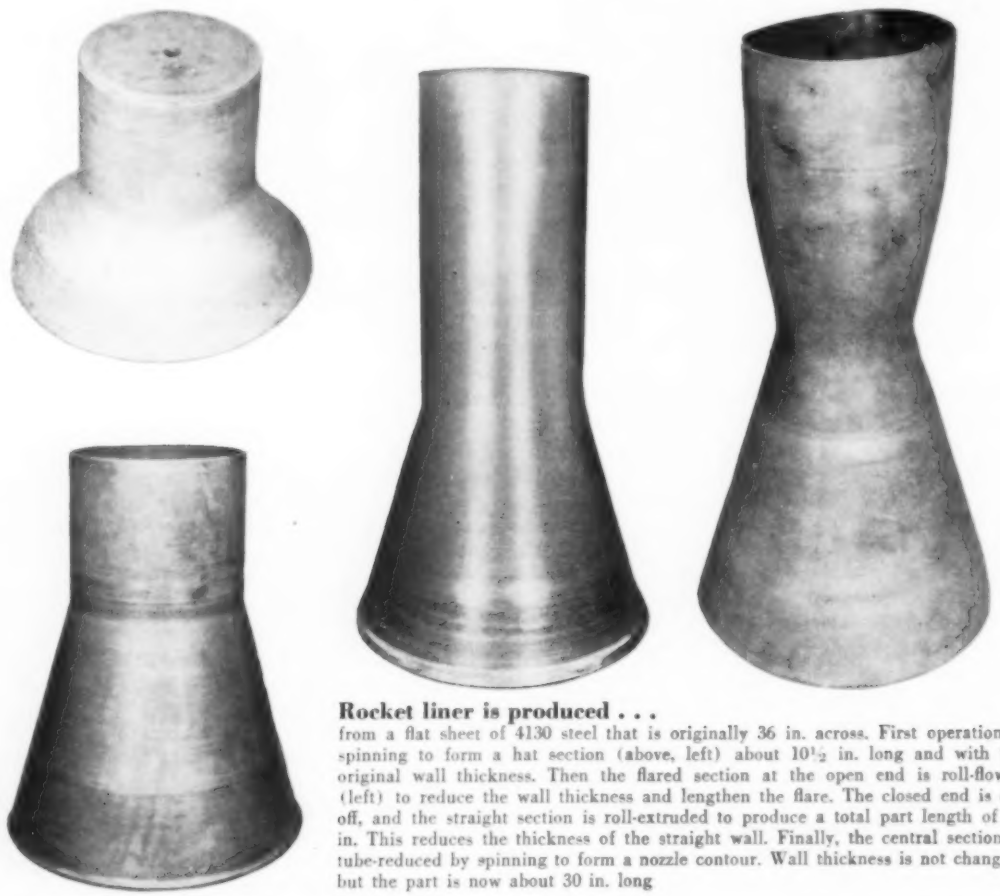
But roll flowing follows the law of sines; a cone is rolled to a wall thickness determined by multiplying the original blank thickness by the sine of the half angle of the cone. Metal is displaced sideways, like a deck of cards, and is developed rather than squeezed.

TERMINOLOGY

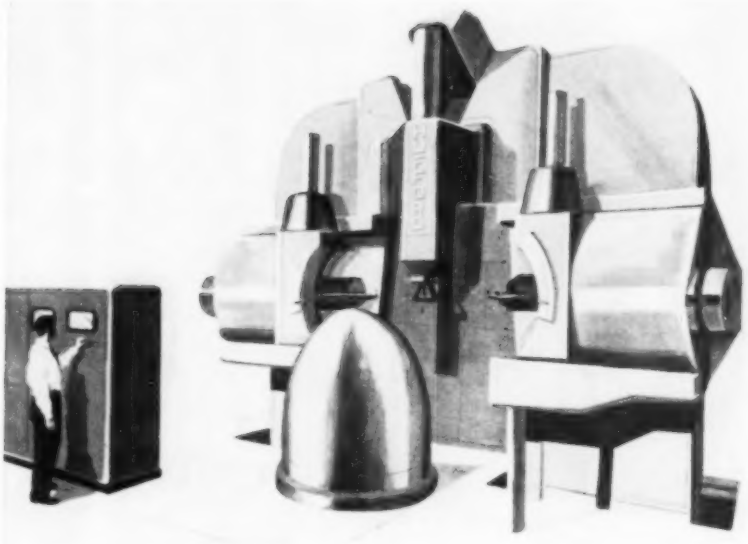
A generic term for this process has not yet become standard in the industry. "Shearforming, "shear spinning," and "roll forming" have been used, but the word "shear" has a connotation of cutting, and "roll forming" can be applied to circular bending. (Until someone comes up with a better generic term, we prefer "roll flowing.")

Roll flowing has another aspect; backward extrusion, which is done with the same equipment and tools. A straight tube is rolled with the tool penetrating deeply into the wall, so the metal extrudes past the roller nose, flowing in a direction opposite to that of tool feed.

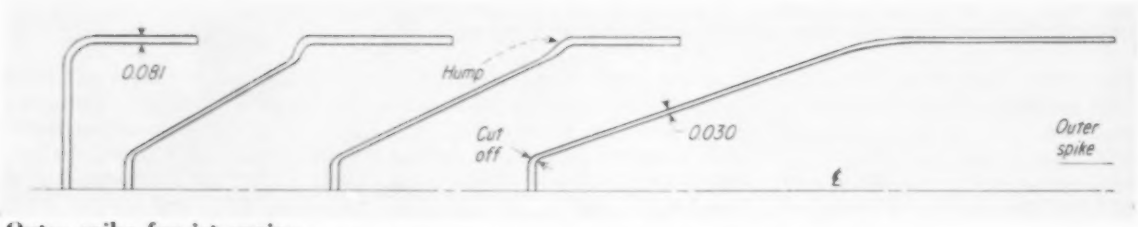
Combinations of roll flowing and spinning are common, and the two processes are often required as different operations on the same part. For example, General Electric's Evendale Gas Turbine Div produces rocket inner liners (thrust chambers) to a nozzle shape with both operations (see below).



Rocket liner is produced . . .
from a flat sheet of 4130 steel that is originally 36 in. across. First operation is spinning to form a hat section (above, left) about 10½ in. long and with the original wall thickness. Then the flared section at the open end is roll-flowed (left) to reduce the wall thickness and lengthen the flare. The closed end is cut off, and the straight section is roll-extruded to produce a total part length of 18 in. This reduces the thickness of the straight wall. Finally, the central section is tube-reduced by spinning to form a nozzle contour. Wall thickness is not changed, but the part is now about 30 in. long



Largest roll-flowing equipment to date . . .
is Hufford Model 166, now being assembled for Marquardt Aircraft and to be delivered around August. Unit is designed specifically to handle cones 60 in. across and 12 in. high, though it will take work as high as 60 in., and will back-extrude material up to a 120-in. length when the tailstock is removed. Machine will reduce 1-in. 321 stainless 50% in one pass to accuracy of ±0.003 in.



Outer spike for jet engine . . .
is started as a drawn blank that is roll-flowed to cone shape. Hump is the critical spot, because here the action changes from roll flowing to spinning. Straight section behind the hump might be back-extruded to reduce the wall, but change of operations is usually impractical

chine was first announced (see artist's conception above).

The machine is designed for constant actual speeds and feeds in relation to the work surface—not necessarily for constant feeds and speeds in relation to the axis of the machine—so the tools will produce constant volumetric displacement of the work metal.

Roll heads will be powered by a 3000-psi hydraulic system, and will be programmed for constant angle of attack against the work, regardless of changes in contour.

A central hole will be provided in the mandrel mount to allow internal work heating. Roll flowing is normally a cold-working process, though one Eastern manufacturer has successfully applied a Flamatic attachment to a Hydrospin machine to heat the work and ease the load on heavy passes. But hot working, in the range around 600 F and higher, is a possibility that should develop when more is known about cold working.

Another Hufford unit, to be erected in the Hufford plant and surrounded by gages and test equipment that will allow "state-of-the-art" experimenting and trial runs, is model 171, now being assembled. This is also a vertical unit with opposed toolslides and an overhanging tailstock bridge that can be swung out of the way. The removable bridge also allows backward extruding for parts longer than could normally be held.

This unit will have 75,000 lb of thrust force on the carriage, up and down, and the same force in and out on the cross-slides. Tailstock force will be infinitely variable from 3750 to 37,500 lb. Variable spindle speeds range from 50 to 500 rpm, and feed rates for carriages and slides range from 0 to 20 ipm. Both rollers will be controlled by two-dimensional hydraulic servos operating from the same templet, though one roller may be operated independently and tool control can be split for separate tracer control if an offset relationship between rollers is desired. Accuracy is expected to be at least within 0.003 in.

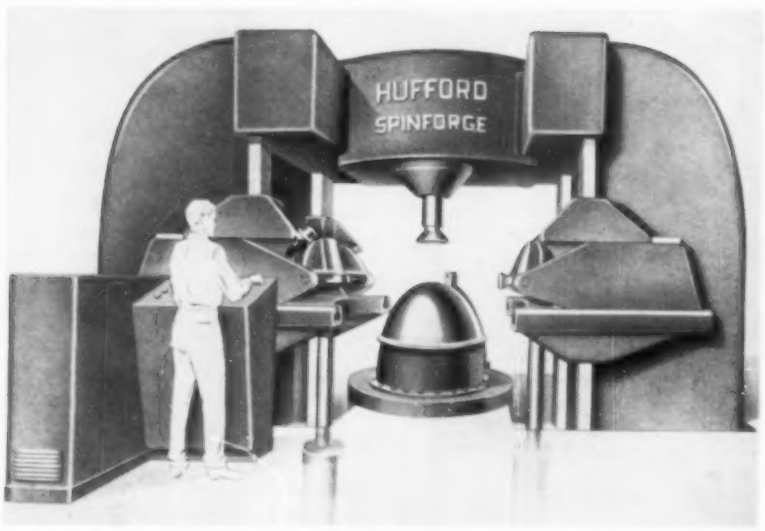
TEST INSTALLATION

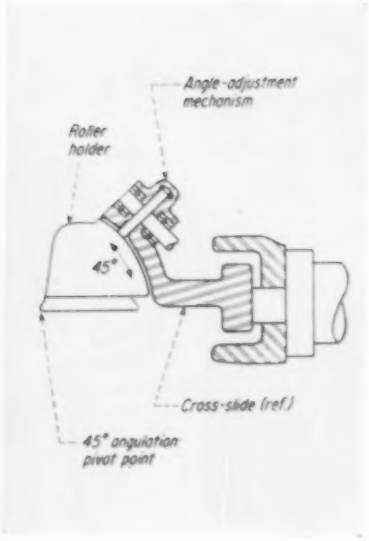
The new machine will be the center of a combined research, development, and production setup aimed to provide development facilities for new engine and airframe components. Total investment is to be about $300,000.

Actually, the state of the art at present is not nearly fully developed. With only something like 50 roll-flowing machines in the country, there is too little practical experience so far to get the most out of the process. Some of the primary problems in roll flowing are:

• Machine deflection—because the forces involved are much higher than normally encountered with cutting machine tools, and because the work does not give as under a cutting tool but keeps fighting

Explorer spotlights roll flowing . . .





Experimental Hufford Model 171 . . .
has 75 spindle hp, 75,000 lb of force on each roller, and will reduce ⅝-in. 321 stainless 50% in one pass. Roller (see sketch) can be adjusted 45° to provide best angle of attack on work. Machine weighs 126,500 lb. Overhead bridge that carries tailstock can be swung out of the way

the roller constantly. These effects are bad enough in aluminum and steel, but worse in materials like titanium, molybdenum, and zirconium. As a result, Marquardt Aircraft has conducted some experiments with blank heating on these more exotic materials. However, sample parts have been formed in practically every material that can be cold worked—but not in coarse-grain metals.

• Constant volumetric displacement—the same problem as with cutting tools, which work best under constant cutting load. If a part is to be contoured to a curve instead of a simple cone shape, the tool feed should be adjustable, both along the work axis and normal to it, so the amount of metal being pushed around is constant. In addition, the actual surface speed over the metal should be constant—and together these constants should add up to a constant volumetric displacement of the work material.

• Constant angle of attack against the work—with the tool roller always at a predetermined angle to the plane of the work surface at the point where the roller contacts the work.

Eventually, the industry is aiming for 3-axis control, probably with numerical devices operated by punched cards or tape.

At the moment, engineering calculations to design the best blank shape and size for a given part, best mandrel shape, and proper distribution of metal in the work are complicated, to put it mildly. The single problem of blank shape —whether to make a preform or not, whether a flat sheet will work —is extremely difficult for many jobs. With more practical background, it will undoubtedly be possible to reduce requirements to computer data and to get much closer to ideal starting conditions before the first rolling pass.

GE tests show how stress controls flow

To establish rough limits on roll-flowing conditions, engineers of General Electric's forming development unit, at the Evendale Aircraft Gas Turbine Div, ran a series of laboratory roll-flowing tests on sample 12-in.-dia blanks of 4130 steel. Each of three blank thicknesses (0.250, 0.375, and 0.500 in.) was reduced 50%, and the theoretical wall size after flowing was, for the 0.250-in. blank, 0.125 in. In addition, blanks in each size were taken under the same conditions to thicknesses 10% over and 10% under the theoretical size.

Roller radii were ¼, ⅜, ½, and ⅝ in., and feed rates were 0.02, 0.04, and 0.06 ipr. These variables were all developed under all possible combinations of conditions to provide a mass of data that could be statistically tabulated to show general trends and specific effects.

Analysis of the 216 tests (each set of conditions was duplicated to reduce chance errors) showed that several general rules can be drawn. In setting up the tests for wall thicknesses 10% over and under the theoretical, it was found that stress had a considerable effect on results. To produce a wall 10% thinner than theoretical, the templet must be placed 10% closer to the work (maximum stress).

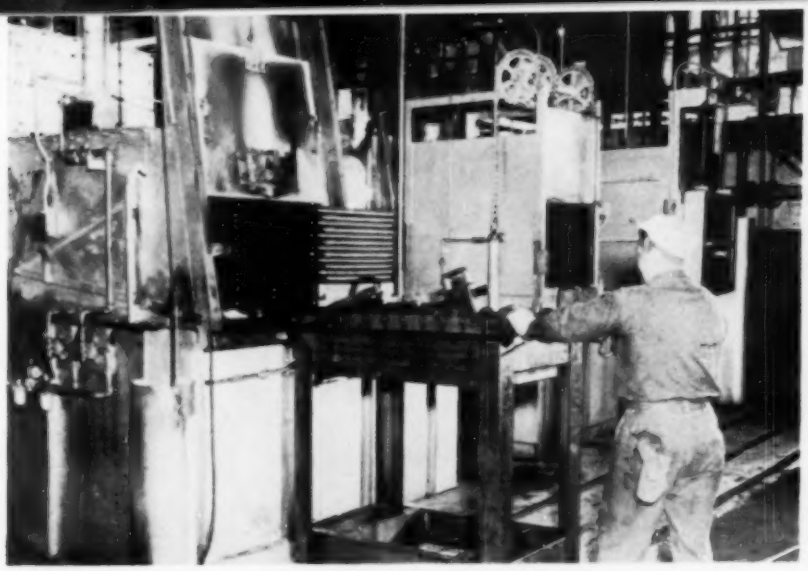
These are the conclusions formed after the tests were analyzed:

Best fit—work against mandrel —was found with minimum radius, maximum feed, and maximum or intermediate stress.

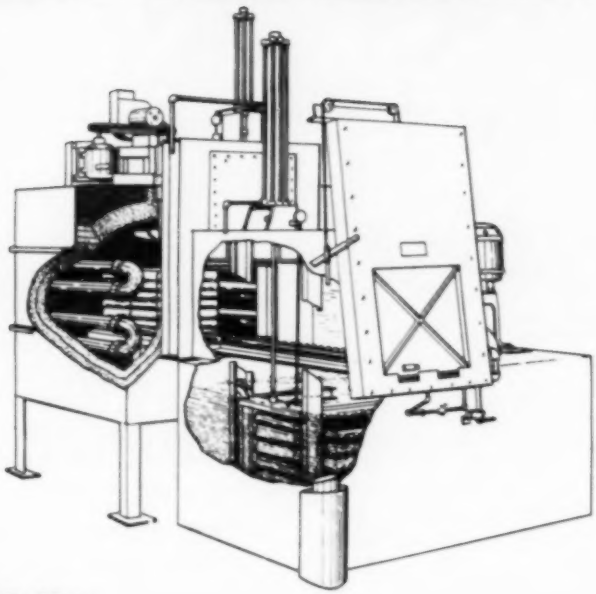
Best wall accuracy was developed with minimum or intermediate stress.

Best finish was produced with maximum roll radius, minimum feed, and minimum stress.

It was also noted that machine deflection had an important effect on results, and the conclusion is that each machine must be individually calibrated for springback in the mandrel, frame, and tooling.



Batch-type . . .
Allcase furnace allows frequent variations in temperature cycles, case depths and other heat-treating requirements for small lots of stamped parts



A built-in quench . . .
tank and hooded vestibule protect the work in the furnace atmosphere during the heat-treating cycle. An elevator quenches the basket of parts

2-Stage Casehardening Reduces Warpage

Carburizing at high temperatures, then quenching at a low temperature, speeds case buildup and cuts warpage to a minimum. Adding ammonia during the cycle gives a modified carbonitrided case

RUSSELL BUYEA, heat-treat manager,
NEW PROCESS GEAR DIVISION
CHRYSLER CORPORATION

Casehardening had become a bottleneck with us. We needed more production but lacked floor space for more salt baths. A more systematic flow of work was required.

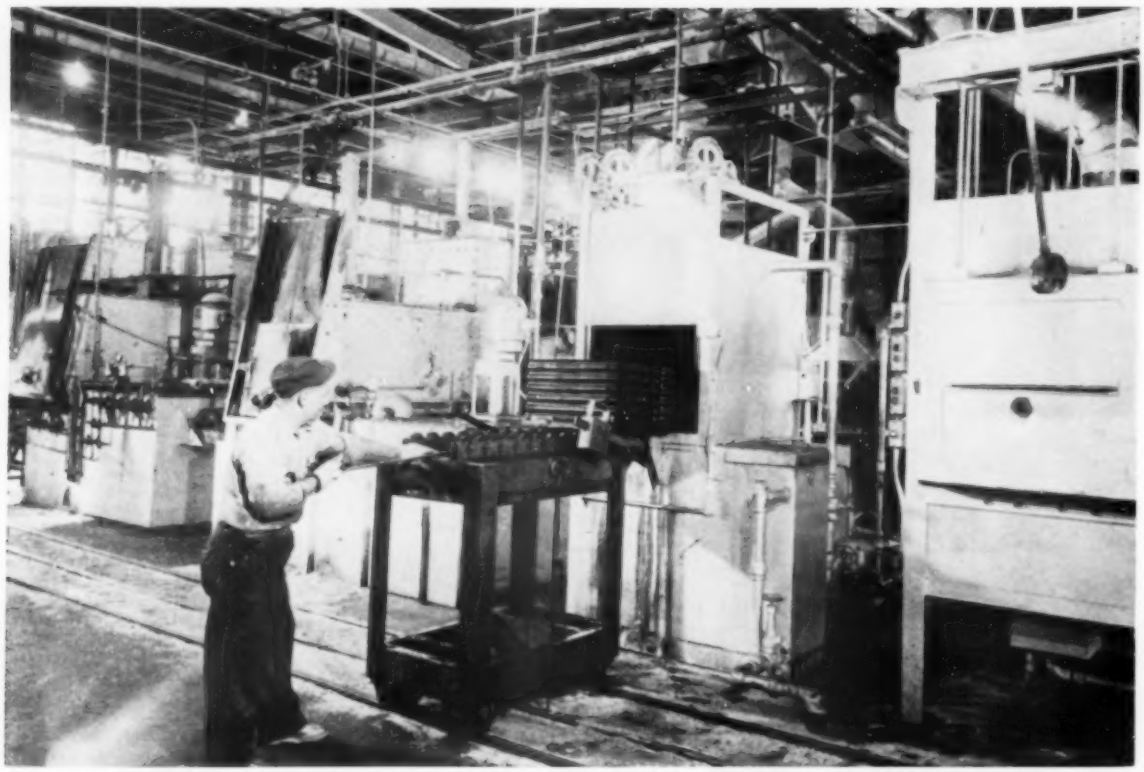
A review of modern heat-treating methods showed that we could switch from liquid carburizing to dry cyaniding (carbonitriding) and save money and floor space. We would get greater flexibility.

We are now able to process many different parts, with a variety of heat-treatments, in four pieces of equipment. These units are two Allcase inclosed quench-type furnaces, a spray washer, and an air-recirculating draw furnace, all built by Surface Combustion Corp, Toledo. The installations are 35 ft long and are served by a charge table that rolls on rails in front of the line. Six large salt baths have been replaced.

The setup has reduced handling time and material-handling costs. One man can handle all the work.

Cleaning costs are reduced. Expense of fixturing the parts and wiring operations is eliminated. With salt-bath heat-treating, blind holes required special attention in cleaning, and grit blasting was

2-stage case hardening reduces warpage . . .



Washed parts . . .
are removed from the spray washer and transferred to the air-recirculating draw furnace for tempering

necessary on many parts. The changeover to batch-type, controlled-atmosphere furnaces eliminated these operations.

Uniformity of hardness is improved because the quench cycle is mechanically duplicated. Case chemistry is more uniform because of consistent, protective atmosphere control and uniform gas distribution within the heating chamber. Two-stage, batch carburizing produces a case in less time, at lower cost, with better warpage control.

PARTS ARE STAMPINGS

Although this furnace line is frequently used for straight hardening and atmosphere annealing, most of the parts are carburized or carbonitrided and hardened. Parts range from tiny washers to large stop rings that have the shape of pie plates with a large hole in the center. Parts are stamped from non-carburizing steels and usually require light cases from 0.003 to 0.020 in. Warpage must be held to a minimum on all the parts treated.

Many of the parts are made from SAE 1006, 1008, 1012, and B-1112 and can be carburized to a case depth of 0.020 in. in 3½ hr at 1600 F. A 0.010-in. case can be attained in 1 hr.

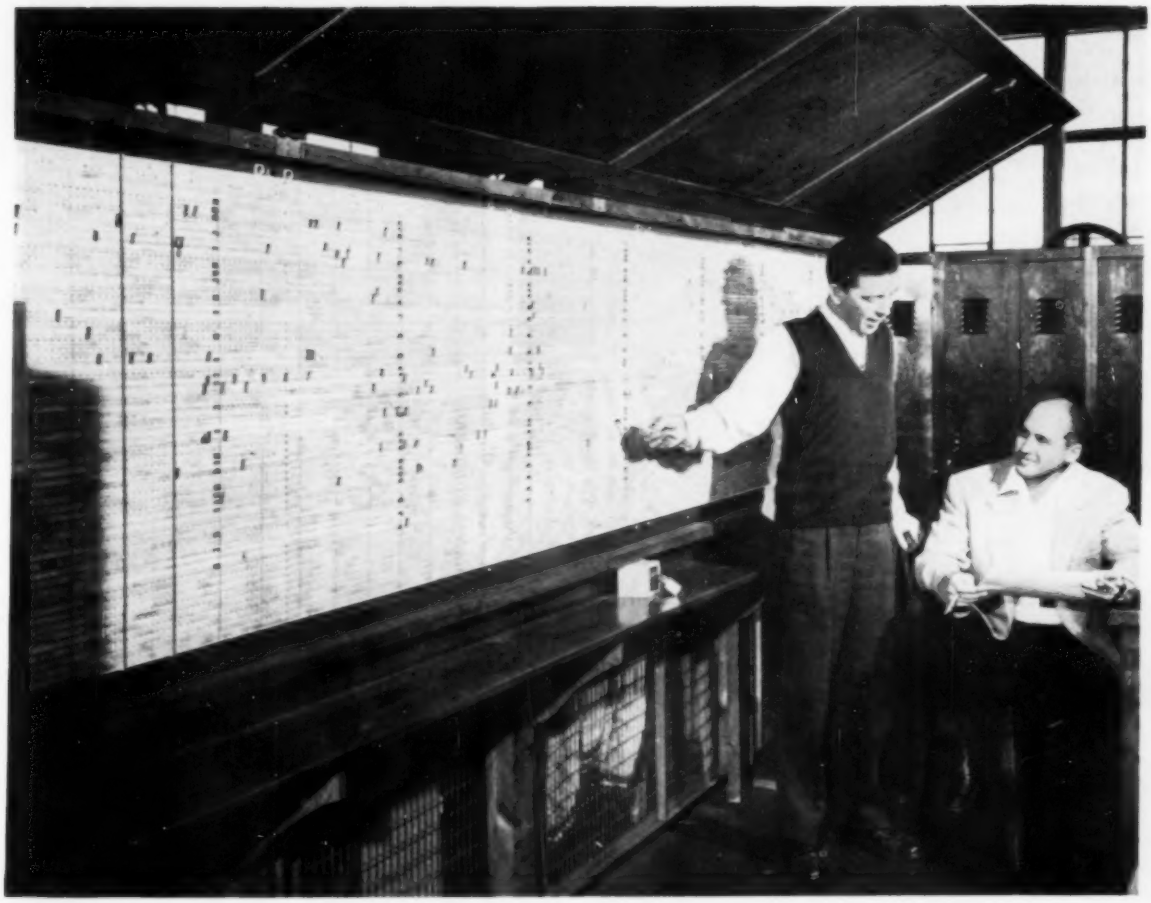
Warpage must be prevented on some critcial parts that require cases up to 0.030 in. Cycles have been developed for the purpose. The parts are carburized at high temperatures for speedy case development, then dropped to the lowest possible quenching temperature before oil quenching. For example, a dished stamping requires a finished case depth of approximately 0.020 in. This part is carburized at 1600 F for 3½ hr, using 400 cfh of RX generator gas, 25 cfh of natural gas, and 80 cfh of ammonia. The temperature is allowed to equalize in 1 hr before quenching. This is done by drawing cold air through the radiant tubes. Furnace atmosphere passing around the cool tubes and through the work permits fast cooling of the charge. The treatment produces a uniform, modified carbonitrided case that quenches out with little retained austenite and little warpage.

MANY OPERATIONS ELIMINATED

Both carburizing furnaces have a vestibule, heating chamber, and an inclosed quench under the vestibule. One of these furnaces has a chamber at the side of the vestibule to cool work in atmosphere at either a fast or slow rate. Parts that are to be selectively hardened after carburizing require controlled cooling after the case is established.

Most work is brought into the department on an overhead conveyor or in skid boxes. Many of the parts are shoveled into baskets, but some must be placed in selected positions within baskets. Two containers 15 by 21 by 16 in. high fit into each furnace. The draw furnace and washer unit also take the same load.

The work is cleaned in the spray washer by a hot emulsion cleaner, which provides a short-term rust-preventive coating.



Pink strips on big board...

Schedule Machine Loads and Cut Shop Costs

STANLEY MANCHUK,
industrial engineering analyst,
CANADIAN WESTINGHOUSE CO LTD

A good production-control system gets the most work out of every machine in the shop. Here's a system that shows planners what each machine will be doing for the next six weeks

A machine-load scheduling board is the heart of a production-control system that currently is saving $14,000 a year in the machine shop of a Canadian Westinghouse Co plant in Hamilton, Ontario. Pink strips inserted in pockets on the board show where work is, when it will be machined, and how long machining will take. Close coordination of schedules on the big board with progress in the shop helps company planners to see that jobs are completed on schedule and at the most economical cost.

The machine shop, where components of large electric motors are made, also serves other departments on a job-shop basis. Forty machinists work here, as well as two toolcrib attendants and several tool grinders. Other regular personnel include a foreman and his assistant, a job planner, a materials expediter, and production, dispatch, and time clerks.

Schedule machine loads and cut shop costs . . .

Dispatch board . . .
issues all jobs to the shop, giving information received from the job planner. Here a machine operator picks up his time and job cards, which he returns to the dispatcher when he completes the job. All information for the job, including data on tools, is listed on these cards

Cards for all jobs . . .
in the shop are distributed by a clerk. Machine-time tabs (½-in. for each machine hour) are cut by the clerk and given to the job planner, who schedules them on the machine-loading board

Because the plant is part of the Westinghouse Motor and Generator Div, all paperwork in the shop is on standard division forms. The system simply makes use of available data to get better control.

THE SCHEDULING BOARD

Key to the system is the machine-load scheduling board (see picture, p113). About 15 ft wide, the board shows, across the top, department schedules for six weeks ahead, plus a two-week backlog. Eight vertical sections represent the weeks, and each week is subdivided into five days.

Each machine in the shop is listed in a column that runs down the left side of the board. Extending horizontally—all the way across the board—are pockets (up to three for each machine, to indicate the number of shifts the machine is working).

To load the board, the job planner inserts pre-cut pink strips in the pockets. These strips carry stock orders, drawing and item numbers, and quantity and operation numbers. And they vary in length, according to how long the machining operation will take—each one-half inch represents one hour.

Working backward from the deadline date on a job, the planner inserts strips (one for each machining operation) in open pockets. Strips are placed in the proper time sequence and carefully inserted to allow completion of the job on schedule.

Once a pink strip has been put in a pocket, an observer can easily see the production picture: What machine will do the job, when the job is scheduled, and (from the pink strip) how long the job will take.

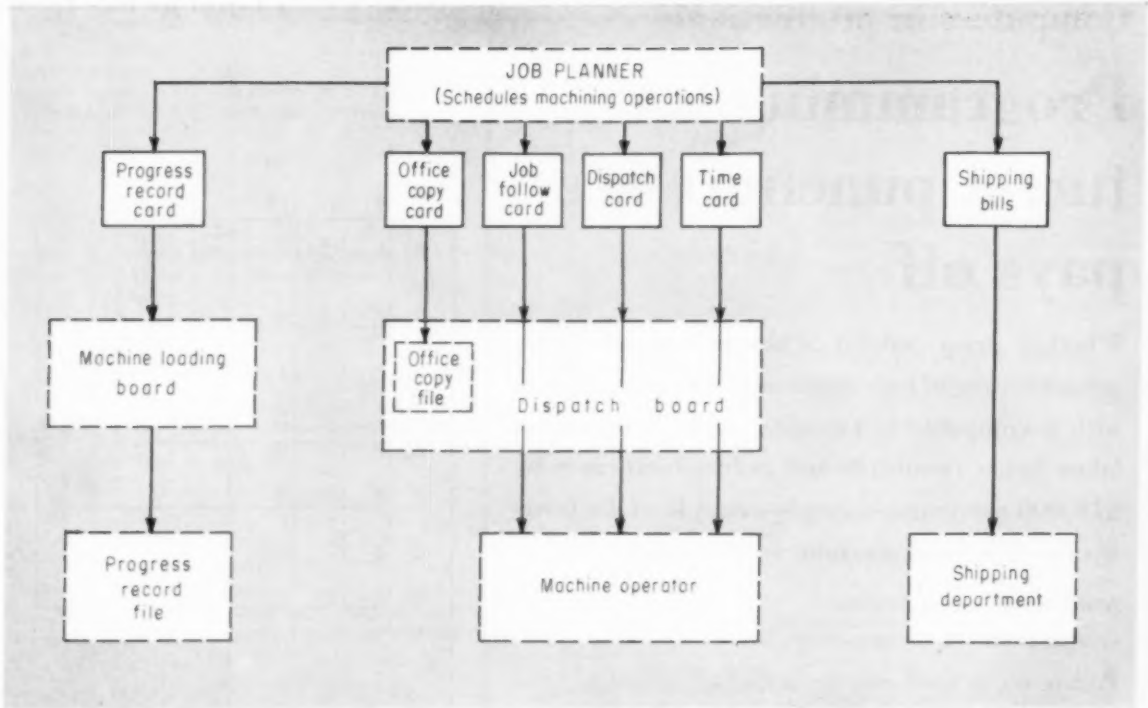
JOB PLANNER SCHEDULES WORK

The job planner is responsible for scheduling the machine operation and for getting the necessary information to the right places. His paperwork consists of filling out, on several cards, all instructions for getting the job done. One of these cards, the progress-record card, goes to the machine-loading board, where the job (with all material and machining data transferred to the pink slip) is visually scheduled for a certain machine on a certain date. A production clerk at the board then files this card.

Four other cards—office-copy, job-follow, and dispatch and time cards for each machining operation—are forwarded to the "dispatch board," a central point from which instructions are issued to the shop. In addition, three shipping bills are sent to the shipper.

All this paperwork may seem complicated, but in actual practice it's quite simple. The planner schedules an operation, records it visually on the machine-loading board, then furnishes the dispatch board with instructions for getting the job done. Now the dispatch board can issue orders to the machine operator, who does the work on schedule.

The accompanying sketch (simplified) shows the



Paperwork flow pattern . . .
for one machining operation is shown here in simplified form. After machining operation, forms are returned to dispatch board, operation is marked completed, and next operation is assigned with other cards. Dispatch board coordinates all operations with machine-loading board, quality-control department, and shipping department

paperwork flow pattern for one set of orders, from job planner to machine operator.

The planner must choose his dates carefully. He does not, for instance, issue instructions to the dispatch board before the raw material for the job has been received in the shop. He may actually schedule the job on the loading board, but if the materials aren't in the shop he applies a blue tab at the first operation. This visual warning shows that the shop needs materials if the job is to be completed.

The job planner must also allow enough time between operations for inspection and movement of material. He also specifies changes in routing or alternate operations. In addition, he keeps a special "due-date" card file on all material orders.

At the machine-loading board, if the completion date for a job is beyond six weeks, the planner decides on a "bring forward" date, and job data is filed nearby, ready for posting on the board.

DISPATCHER GETS THE JOB DONE

Once he has received the proper instructions from the job planner, the dispatcher issues the job to the proper machine. The machine operator receives all cards and drawings needed to get the work done on schedule. Instructions for subsequent operations are sorted into pockets at the dispatch board, according to dates shown on the machine-loading board.

When he finishes the operation, the machine operator returns the cards to the dispatch board. Now the dispatcher schedules the next operation and issues orders to the proper machine. At the same time he notifies the machine-loading board, where the production clerk checks off his file card and pulls that operation's tab from the board.

After all operations on a part are completed, the dispatcher puts the dispatch cards for the completed item into a "final inspection" box. The Quality Control department checks this box periodically, makes the required inspections, and turns the paperwork over to the shipper, who correlates this information with the shipping bills he received earlier from the job planner. The part is shipped, and the cards are returned to the dispatch board and machine-loading board for closing out the records.

CONTROL SYSTEM PAYS OFF

In addition to the money it is saving, the production-control setup helps in other ways:

- Materials are closely controlled.
- Production-control duties are broken down into separate units. New personnel can perform work before they learn the entire system.
- Job control is assigned to a member of the production-control department; now the foreman and assistant foreman can concentrate on administrative and supervisory duties.
- "Rush-job" processing is held to a minimum.
- Idle time in the shop, per machine and per operator, has been reduced appreciably.

Computers in production:

Programming for turret punchpresses pays off

Whether press control is manual or automatic, programming of hole location and punch selection with a computer is valuable. Allis-Chalmers cut labor hours two-thirds and reduced expenses by $16,000 per year—a simple example of the benefits possible from computers in manufacturing

A H KNABLE and R STOWE

ALLIS CHALMERS MFG CO, MILWAUKEE

Perforation of metal-clad for instrument panels is accomplished with a Wiedemann turret press. Operation of this press can be automatic or manual, but for either method the initial data for hole location and turret station selection must be determined before any operations can be performed.

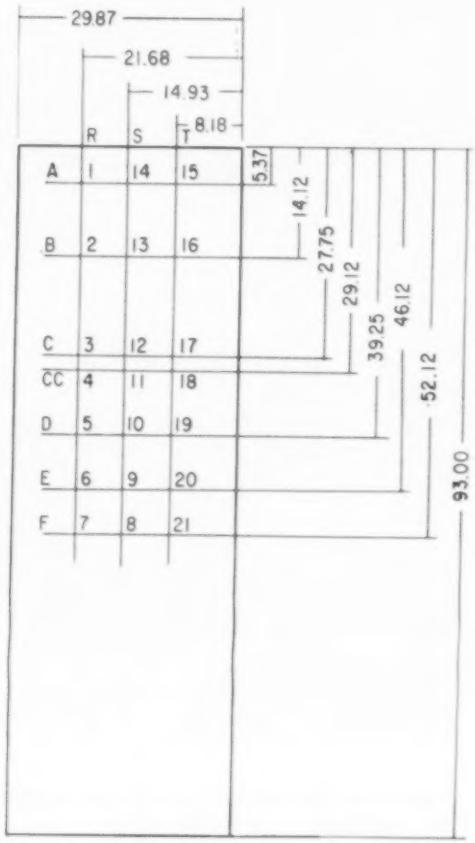
In the past, preparation of initial data was done primarily in longhand, frequently with the aid of a desk calculator. Many hours of expensive labor were spent in calculating and recording the table positions and the dies associated with each position before a "punch chart" was ready for the press operator. This initial data for the "punch chart" is simple, but calculation is laborious. While press positions are determined by simple additions or subtractions, the repetition introduces monotony. Expensive labor is necessary to minimize error. Errors are costly when parts are scrapped by incorrect punching. Here, briefly, are the mechanics of making a punch chart:

A metal panel face in flat-sheet form must be perforated as specified on a design drawing. Two things are done: The position of the die in terms of rectangular coordinates is calculated and the proper die for each particular perforation is selected. Because the 32-odd dies on the press are relatively small in comparison with the instrument holes, a series of small perforations is used to produce the perimeter of the instrument holes, with the appropriate dies. This procedure requires many positioning calculations, which can be done in a very straightforward fashion by a digital computer, for these reasons:

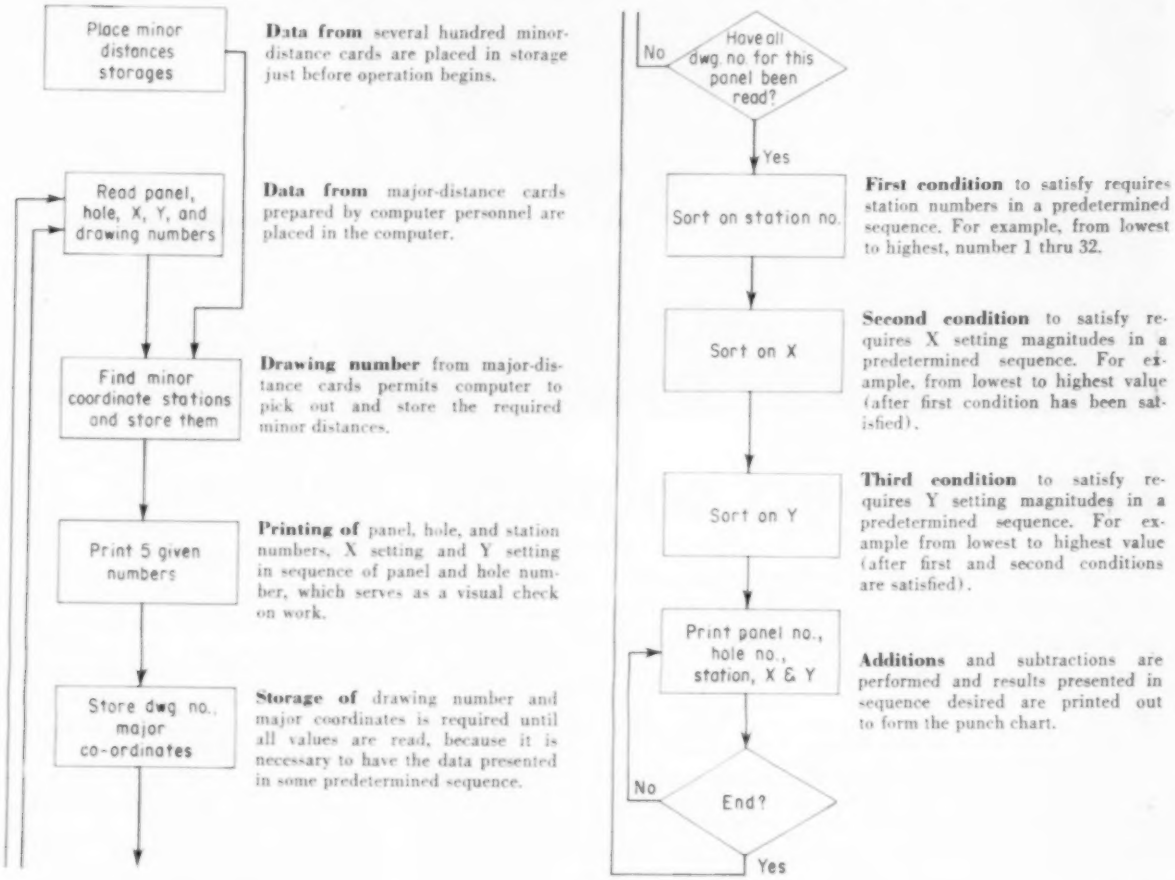
1. The several hundred different-shaped instrument holes can be analyzed once and for all in detail, not only for type of die but also for die positioning, when the center of each hole is used as an indvidual fixed reference point. The distance from the center of the hole to the center of the die position (in terms of rectangular coordinates) need be recorded only once, because these "minor distances" never change, regardless of where the hole is located on the panel face. Then, to get the actual machine setting, it is only necessary to superimpose the distance from the hole center location to a fixed reference point on the panel face. (A corner of the panel could be such a fixed reference point.) Again, this second distance would be in terms of rectangular coordinates, is called the "major distance."

2. The position of the center of the instrument holes is, usually, repetitive, hence these major distances can be considered semi-fixed and completely flexible—"flexible" because positions can be added to or deleted from the repetitive "standard" major distances that are pretabulated. As the computer requires the information on punched cards, the minor distances can be punched in these cards and given storage addresses. Thus, information is stored in the computer, awaiting the calculations to be performed. These calculations (simple additions and subtractions) can be done by punching into the in-

Coordinate Panel Layout for Hole Location



Computer Sequence of Operation in Block Diagram Form


Place minor distances storages
Data from several hundred minor-distance cards are placed in storage just before operation begins.
Read panel, hole, X, Y, and drawing numbers
Data from major-distance cards prepared by computer personnel are placed in the computer.
Find minor coordinate stations and store them
Drawing number from major-distance cards permits computer to pick out and store the required minor distances.
Print 5 given numbers
Printing of panel, hole, and station numbers, X setting and Y setting in sequence of panel and hole number, which serves as a visual check on work.
Store dwg no., major co-ordinates
Storage of drawing number and major coordinates is required until all values are read, because it is necessary to have the data presented in some predetermined sequence.
No
Have all dwg. no. for this panel been read?
Yes
Sort on station no.
First condition to satisfy requires station numbers in a predetermined sequence. For example, from lowest to highest, number 1 thru 32.
Sort on X
Second condition to satisfy requires X setting magnitudes in a predetermined sequence. For example, from lowest to highest value (after first condition has been satisfied).
Sort on Y
Third condition to satisfy requires Y setting magnitudes in a predetermined sequence. For example from lowest to highest value (after first and second conditions are satisfied).
Print panel no., hole no., station, X & Y
Additions and subtractions are performed and results presented in sequence desired are printed out to form the punch chart.
No
End?
Yes

put cards the appropriate semi-standard major distances with appropriate addresses and feeding the cards into the computer. The resulting print out is either a punch chart for the press operator which shows him the machine settings for each distance and die, or a deck of punched cards containing the information for automatic setting, which can be inserted into the automation unit of the press.

In sequence, operations by the various personnel from the designer to the press operator are:

1. The engineer records the panel arrangement he desires on a sheet by placing the instrument drill-drawing number in the row with the position number desired. This drill-drawing number serves as the address for the major-distance cards.

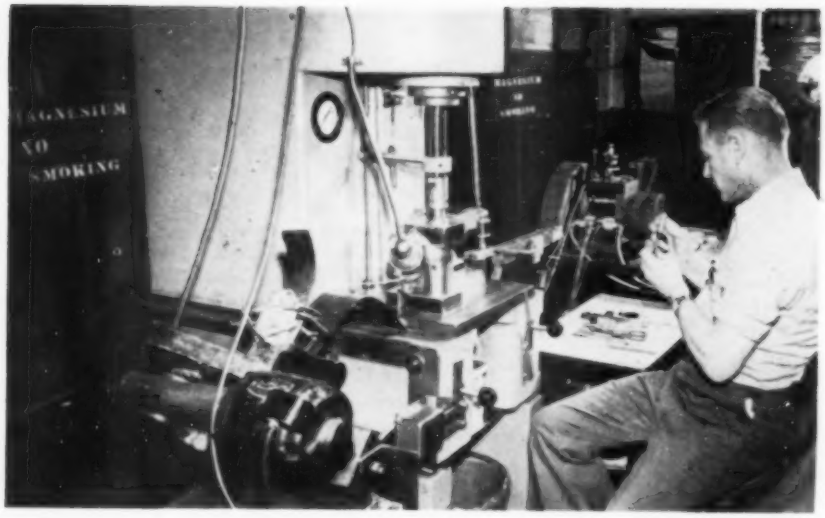
If a special job requires a non-standard location (a position that is not preprinted on the form), the engineer merely calculates and enters on the form the non-standard major X and Y dimensions in addition to the drill-drawing number.

2. The filled-out standard punching tabulation sheet is sent to the computer laboratory, where a punch chart is made. Personnel in the computer laboratory simply punch the values of X, Y, and the drill-drawing number addresses on cards that will be fed into the computer. The drill-drawing address combines the major distances with the appropriate minor distances, which are stored in the computer and similarly addressed. Data from the minor-distance cards are placed in computer storage just before the operation starts and are removed when the operation ends.

3. The computer performs the operations specified in the sequence shown in the block diagram.

4. The punch chart is received in Engineering where the drawing number, order number, and other pertinent information are applied to it before sending it to Manufacturing which, in turn, sends it to the press operator. Step Four as stated assumes manual operation of the press. If operation is automatic, the results are left in card form and the cards are placed in the automation adapter on the press.

The manhours of labor are reduced to one-third of the original time, a saving of approximately 2000 manhours per year. While a reduction in error resulted, actual figures are not available. Reduction in expense is approximately $16,000 per year.



Operating at 255 spm . . . modified hydraulic press turns out approx 70,000 magnesium buttons each 8-hr shift. Press is equipped with auxiliary stock-sizing rolls, a progressive die, and a scrap chopper. Automatic controls and safety limit switches permit one operator to handle three such press lines

High speed coining

Mass production of small magnesium buttons, usually a job for a high-speed automatic screw machine, proved more economical when done on a hydraulic press with a three-stage progressive die

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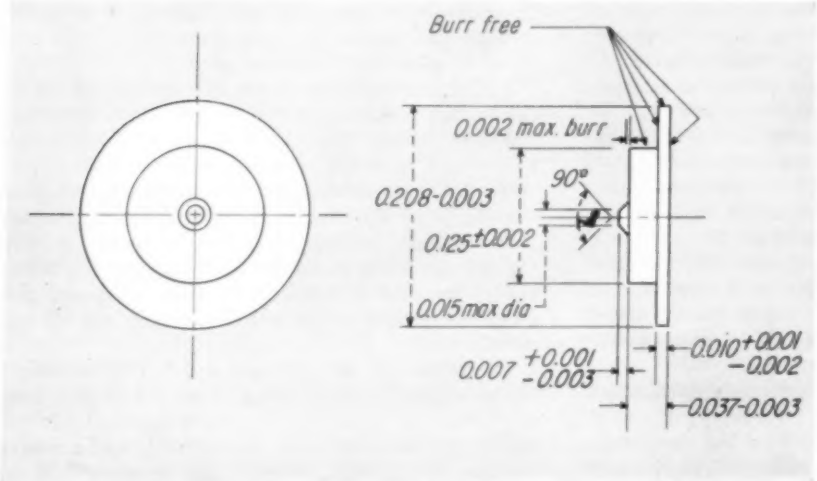
MINNEAPOLIS-HONEYWELL REGULATOR CO
MINNEAPOLIS 8, MINN

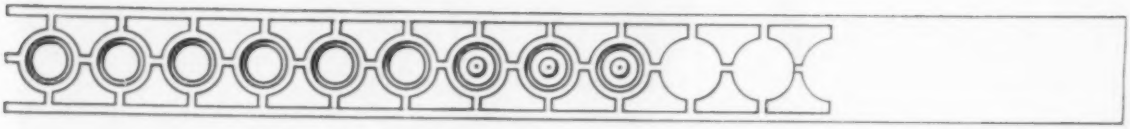
Minneapolis-Honeywell has modified an 8-ton hydraulic press to coin and blank small magnesium buttons for an ordnance item. The press, a Denison FH4C64, is fitted with a 3-stage progressive die, a 6-ton cylinder and special high-speed valves. In an 8-hr shift, it can produce approximately 70,000 buttons.

Coining and blanking the buttons from coiled strip stock proved to be more economical than turning them from bar stock on an automatic screw machine. In the coining operation, final dimensions are a function of the slug size which, in turn, is a function of the stock thickness. For this job, the commercial tolerances on the thickness of purchased strip stock were too wide for accurate control of finished part size. This problem was solved by feeding the stock through a separately-powered rolling machine designed and built by Minneapolis-Honeywell's toolmakers apprentice group.

Driven by a ¼-hp, 1150-rpm motor through a Reeves adjustable-speed drive and a 9:1 gear reducer connected to the lower roll, the rolling unit holds thickness of stock delivered to the progressive die between 0.202 and 0.208 in. Thickness is controlled by the depth of the groove ground in the friction-driven upper roller, and by adjustment of the four



Extruded, coined, and blanked . . . from pure magnesium strip, this button costs less than when turned from bar stock. Also, tight tolerances are easier to hold. Stock sizing rolls control thickness of strip fed to die



Pure magnesium strip . . .
0.202-0.208 in. thick and 0.625 in. wide, advances 0.4375 in. for each stroke of three-stage progressive die. Press stroke is ¾ in. Holes are used for piloting and for stock advance with hitch feed

Belleville-type springs which hold the rollers in contact. Variations in thickness are easily held to within 0.0001 in.

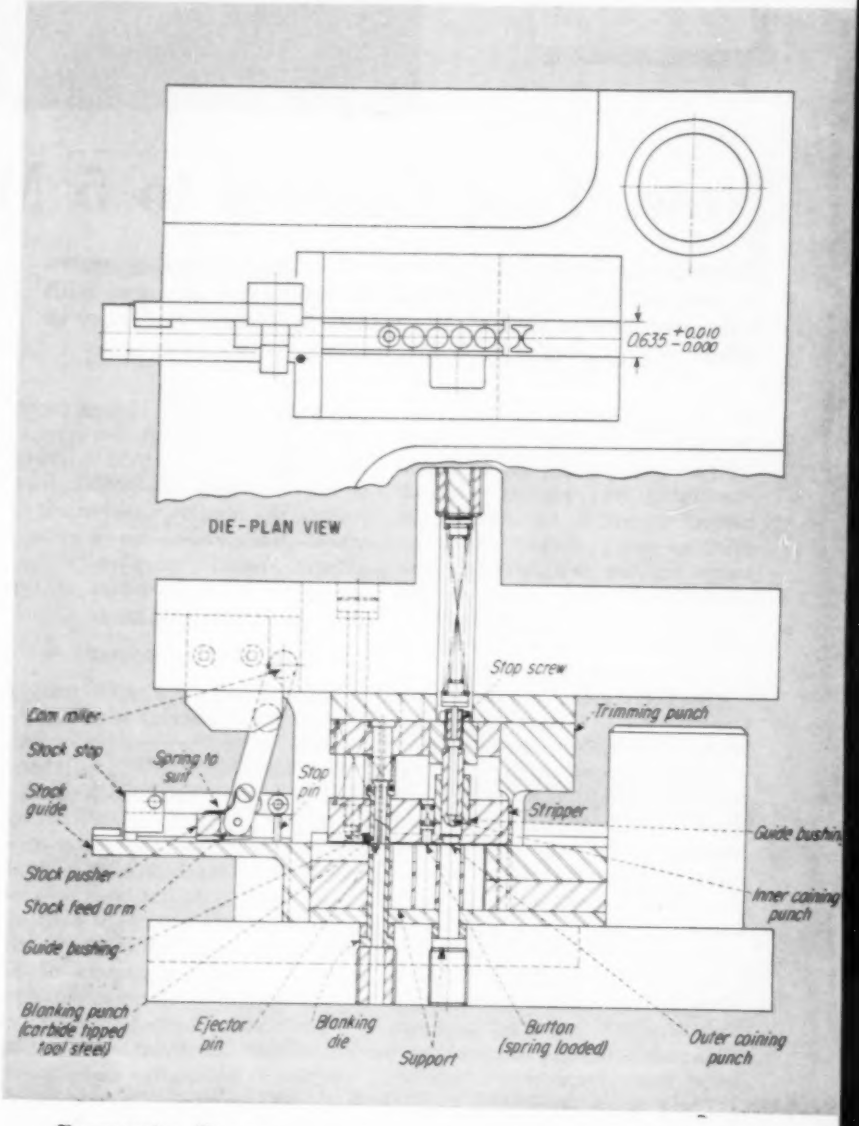
Four lever - actuated Microswitches control movement of the strip stock through the rolling unit and into the die. Two of these switches are wired to the rolling machine, and control upper and lower limits of the slack loop between the rollers and the guides leading to the die.

If the incoming stock has excessive camber or flaws which cause it to be rolled to widths wider than the die can handle, the stock will not pass through a restrictor on the arm of a third switch. This switch actuates a solenoid clutch-lock release which stops the press. The actuating lever of the final switch is supported by the passing strip. When the end of the strip passes this point, the lever drops off the end and the press is stopped to prevent the die from operating empty.

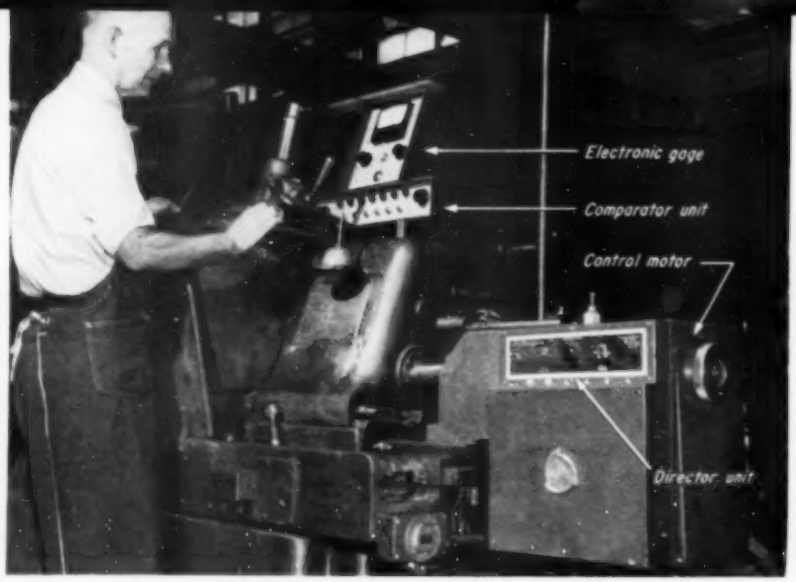
DIE DESIGN

The progressive die, with three working stations, has produced many runs of over five million buttons per die sharpening. Spring-loaded inner coining punch, HSS hardened to R$_c$58-62, produces a small conical tip on the center of the button. The tip of the punch is lapped to a sliding fit in the outer coining punch. The carbide-tipped blanking punch is guided by a spring-loaded, hardened tool steel bushing which also acts as a secondary stripper. Point of this punch is countersunk to a 90° included angle ground to a sharp edge. In the center of the blanking punch is a spring-loaded, hardened tool steel ejector pin which has a 0.102-0.105-in. concave radius ground in its tip.

As they are blanked from the strip, the buttons fall into a container under the press bolster. The blanked strip then passes through the hitch feed unit and into a separately - mounted, motor - driven scrap chopper.



Progressive die . . .
has three working stations. First station has two trimming punches which pierce triangular holes to relieve strip and permit proper impact extrusion. Hardened tool steel punch at next station extrudes and coins part to size, but leaves it intact in strip. Third station uses a tungsten-carbide-tipped punch to blank part and push it through blanking die into container under press bolster



Control setup . . .
that gives wheel-slide control to 5 millionths consists of linear-actuator (Inchworm) motor connected to regulating-wheel slide of a No. 2 Cincinnati centerless grinder. A Microtrol electronic gage gives feedback corrections. Except for setup and wheel dressing, no operator is required

Now, Tool Control to 5 Millionths

Micro-inch dimensional control of centerless grinders can be accomplished by replacing the leadscrew and nut with a linear-actuator motor. It's relatively simple and easy to adapt this powerful feed mechanism to machine tools

Automatic feedback for size control is the modern answer to many tolerance problems in precision machining. But what if feedback corrections are so minute that the machine can't always physically carry out the orders? Microinch correction signals, no matter how accurate, are useless if the machine is unable to respond with microinch movement of the tool.

The Torrington Co (Torrington, Conn) used to have this problem with the centerless grinders on its needle-bearing production line. When a corrective force was applied to a machine's leadscrew, the leadscrew "wound up" like a spring until enough force was accumulated to overcome the static friction between the regulating-wheel slide and the machine ways. Then the slide lurched forward, often by an amount greater than that required to correct part size. This "stick-slip" problem ruined a lot of high-precision bearings.

There is a minimum rate at which continuous motion of a body can be maintained. Below this rate, motion becomes incremental, consists of a series of steps. Any system's *minimum* increment of motion is dependent on a number of factors including the ratio of break-loose force to sliding force, mechanical rigidity of the system, and the manner in which the force is applied. Torrington's problem: Reduce the minimum increment of wheel-slide motion so that the grinder could consistently respond to feedback orders in the millionth-of-an-inch range.

STICK-SLIP PROBLEM SOLVED

The company's solution was to replace the leadscrew with a linear-actuator motor, the Inchworm, Airborne Instruments Laboratory, Inc. Doing this reduced the minimum increment of slide motion by a factor of 15. The new setup produces finer bearings with tighter tolerances. There has been no sacrifice of quality control or production rates, and the automatic system relieves operators of as many fatigue problems as possible.

The linear actuator produces controlled increments of motion relative to two parts—one stationary and one fixed. There is a very rigid connection between the parts, because no leadscrew and nut, and no bearings, are in the path of force transmission. Also, the torsional factor is eliminated, and the system's response to correction signals is more positive.

This micro-inch control system is extremely rigid, yet is reversible and essentially free of backlash. It also is free of the wear-inducing lost motion found in oscillating or vibrating systems.

HOW THE ACTUATOR WORKS

The motor actuator provides precise movements of heavy loads over minute distances. Motion results from *magnetostriction*, the linear change in dimension that occurs in certain materials (such as nickel) when they are placed in a magnetic field (such as that created by current in a coil of wire). The magnetic field causes the magnetostrictive material to shorten; when the current is shut off, the material returns to its original length.

Motion is produced by shrinking the actuator's magnetostrictive armature while a hydromechanical clamp on one end of the armature is locked. This action allows one end of the armature to move. A second clamp on the other end of the armature is then locked; at the same time the first clamp is unlocked, and the magnetic field is removed, so that the armature expands. The result is that the armature moves lengthwise. This motion may be forward or backward (depending on the order in which the clamps are locked and unlocked) and closely controlled (depending on timing of current through magnetic coil).

Motion is transmitted from actuator-motor to grinder slide in this manner: The motor base is bolted to the grinder bed, and the magnetostrictive armature is attached to the regulator-wheel slide. Movement of the armature through the clamping, magnetostrictive, and unclamping actions moves the wheel slide. Wheel-slide movement can be as small as 0.000005 in. or as large as 0.000100 in., depending on the current through the coil.

HOW THE SYSTEM WORKS

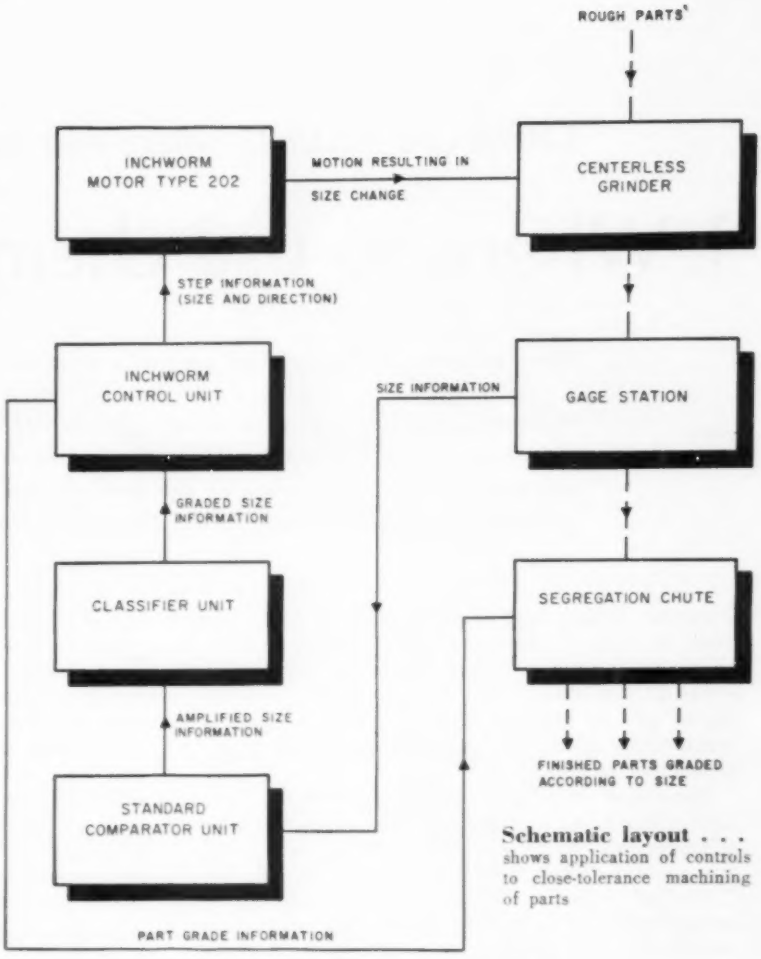
Electronic gaging equipment—a Microtrol unit, AIL—makes the grinding system automatic. This equipment accurately determines when a slide adjustment is necessary, then transmits corrective instructions to the control mechanism.

Here's how the automatic size-control system works. As parts are ground, they are gaged and the measured size is compared to the desired size. This information is transmitted to an electronic "brain" that decides whether the wheel-slide position should be corrected, in which direction, and by how much. This data is then fed to the Inchworm, which controls movement of the grinder slide.

The gaging system is selective. It won't correct for a single part that may be accidentally over-size. But if successive parts are not ground correctly, the gage's feed-control circuits average errors over several pieces, and actuate a correction cycle when these composite error-signals exceed control limits. Because delay time in averaging the size of several pieces is relatively large, the control system is stabilized to compensate only for slow rate variations, such as grinding-wheel wear, temperature changes, and trend variations in input size.

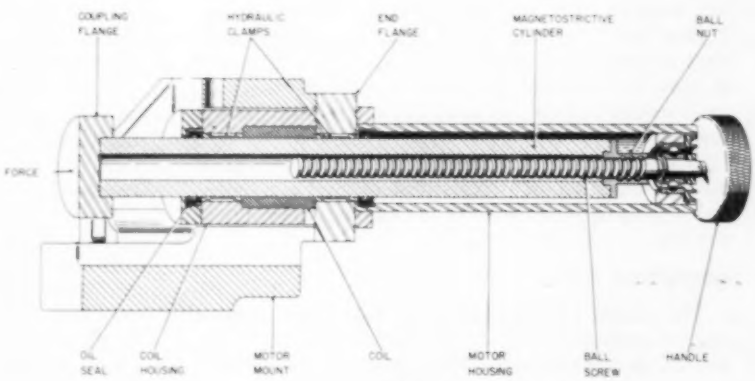
MORE OUTPUT, FEWER REJECTS

Positioning with this system is so easy and so accurate that setup and operation of centerless grinders is extremely simple, even for relatively green workers. By virtue of the Inchworm's ability to position the regulating wheel slide to an accuracy of 5 microinches, trend variations in output size have been almost completely eliminated. Thus, part tolerance is solely a function of the machine scatter pattern, which is usually less than 0.00005 in., even with relatively large variations in input stock size. Ever since Torrington retooled its centerless grinders, there has been a marked improvement in size control. In fact, rejects have been cut so drastically that production of usable parts has spurted considerably.



Schematic layout . . . shows application of controls to close-tolerance machining of parts

INCHWORM CONTROL SYSTEM



Actuator motor . . . (shown here in cutaway view) provides controlled micro-inch movement through magnetostrictive effect. Hydraulic clamps act in unison with armature to convert expansion and contraction of armature into forward or backward motion. Coarse feed wheel and leadscrew are only for setup purposes. In normal operation, the magneto-strictive feed over-rides the ball worm and nut, allowing the coarse feed to be used only when both clamps have been released.

CHEMICAL MILLING: where and how

1. Where to use chemical milling

JAY SULLIVAN, assistant to the president,
UNITED STATES CHEMICAL MILLING CORP, MANHATTAN BEACH, CALIF

Simultaneous processing of many parts is the key to mass production with chemical milling. Here is an outline of the capabilities and limitations of the process and some of its possible applications outside the aircraft industry

Chemical milling and machine milling have one thing in common: both are basic production techniques that remove metal. But metal removal is where all comparisons come to an end. The two techniques are so different that neither one entirely replaces the other, and both are often found in one production schedule.

The major difference is that machine milling is a mechanical cutting or gouging of a softer metal by a harder tool, while in chemical milling the metal is removed with chemical solutions.

Another essential difference is in the kind of surface that can be readily milled. The mechanical method is rapid and low-cost, but, without elaborate tracing equipment, it can remove metal only from simple planes, whereas its chemical namesake can remove metal not only from the most complex curves but also from all the surfaces of an entire part at one time. Moreover, in chemical milling it is possible to produce a large number of parts simultaneously. This is a principal key to its potential low cost.

When manufacturing people learn precisely what can be expected of it, chemical milling can be as valuable a production tool as casting, forging, or cutting.

CONTOURED PARTS

The ability of the process to mill complex contoured parts comes from the fact that metal is removed in a plane parallel to the original surface, whatever that happens to be. (Tapers are an exception, of course. They are made by controlling the rate of immersion into and withdrawal from the chemical solution.)

Therefore, contoured parts are as easy to mill as flat stock. This not only adds a new flexibility to the production procedure, but in many cases, it actually helps simplify the forming operation. For example, heavy sections can be provided to withstand the stresses of forming. Then this excess material can be removed during chemical milling.

The new process also helps to eliminate cases where the design of the product has been dictated solely by the needs of the manufacturing process. One example is in the design of castings with intricate interior sections, such as those for power-take-off drives on internal combustion engines. Access holes must be left in these castings so that drills and other power tools can get in and do the internal machining. In addition, cover plates and gaskets must be provided for the access holes. But, if the internal areas of the housing are chemically milled, the design and production problems associated with the access ways are eliminated.

EFFECTS OF PREVIOUS OPERATIONS

Previous operations can affect a metal in three ways that influence subsequent chemical milling: surface effects due to the tool or die, grain effects due to working the material, and effects due to the penetration of lubricants during processing.

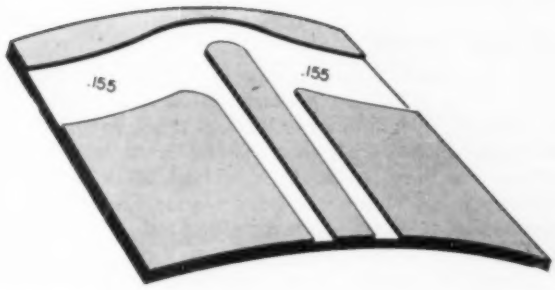
Surface effects, such as mismatch lines on castings or forgings and tool marks on machined parts, are not removed by chemical milling. Therefore, if the lines or marks are objectionable, they should be removed prior to chemical milling.

Grain structure has an important effect on the surface finish of a chemically milled part. The finer and more uniform the grain, the smoother the finish. As a rule, metal that has been hot worked will etch to a smoother finish than cold-worked material. The directional characteristics of the grain structure must be taken into account, because they affect both the surface finish and the strength of the material. However, production already specifies the direction in which most sheet-metal parts are to be cut, so this will not pose any new problems.

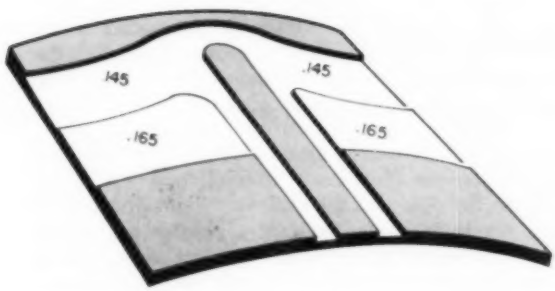
Lubricants worked into the surface during forming operations could cause trouble during chemical milling by lowering the adherence of the maskant. All parts received at USCM, therefore, undergo a thorough degreasing prior to milling. This simple precaution virtually eliminates rejects due to failure of the maskant.

Parts that have been spun, however, generally

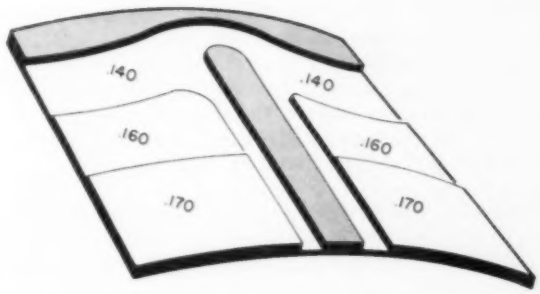
1. Maskant is applied . . .
to entire surface of a formed aluminum sheet, 0.175 in. thick



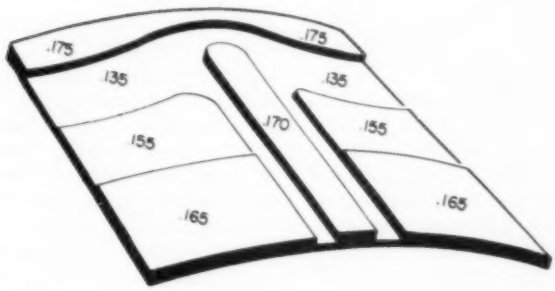
2. Chemical milling removes 0.020 in. . . .
after maskant is scribed and stripped from appropriate area



3. Second step removes 0.010 in. . . .
from the first as well as the second areas to be uncovered



4. Three different levels . . .
are all etched 0.005 in. deeper during third immersion



5. All areas reach final thickness . . .
at same time, after center section is stripped and an additional 0.005 in. is removed. The top section, covered by maskant during entire process, remains at original thickness. All scribing is done from a single templet, color coded to indicate order of steps. Cost of the epoxy-fiberglass templet is usually between $200 and $300

contain lubricant worked deep into the surface, sometimes as far as 0.015 in. Before these parts are masked, the contaminated surface material must be removed by all-over chemical milling. This factor may have to be considered at the design stage.

CHOICE OF ALLOYS

All wrought and forging aluminum alloys such as alloys 2S and 25S have been milled successfully. In addition, all aluminum alloys in the T condition have been etched with good results. Tempered materials give the best finish. A surface finish of 125 mu-in. can be obtained on the higher heat treatments, and at worst, a finish of 250 mu-in. can be obtained.

Magnesium yields exceptionally smooth surface finishes. Experience seems to indicate that the temper does not have noticeable effect on the surface finish of this metal. Finishes under 100 mu-in. are being obtained consistently. The results of experimental work currently in progress indicate that practically all magnesium alloys, including sand castings, can be successfully milled.

Even smoother finishes are obtained on titanium alloys, as the surface finish of these particular alloys is improved by etching. Surface ridges and grooves tend to "wash out" during milling, giving finishes in the range of 40 mu-in.

The chemical milling of steel alloys is still in an early stage of production, so not very much information is currently available. However, it appears that most of the steel alloys can be successfully etched. Excellent surface finishes are obtainable on cuts of ¼ in. or less.

Some degree of hydrogen pickup can usually be expected in carbon steels. However, this can be entirely eliminated by doing the final heat treating after chemical milling. None of the other alloys that have been chemically milled show any evidence of hydrogen pickup.

The problem of specifying tolerances for chemical milling will be nothing new to production personnel. However, depth tolerances can be stated only in relationship to the tolerance of the original material —chemical milling cannot true up a surface. A tolerance of ±0.003 in. can be specified on depth cuts of 0.125 in. or less, and on deeper cuts a tolerance of ±0.005 in. Tolerances considerably closer can be held on very light cuts.

TAKING ADVANTAGE OF CHEMICAL MILLING

One of the greatest advantages of chemical milling is its ability to perform operations that are impractical or impossible with machine tools. Chemical milling can easily mill many of the hard alloys, and the parts can be either flat or contoured. The process is also useful on magnetic materials whose magnetic properties are often impaired by machine milling. Of course, the problem of work hardening is nonexistent in chemical milling. An added advantage is that the parts produced are clean and in good condition for painting or surface treatment immediately after milling.

The basic chemical milling applications are divided into three categories: weight removal, cutting, and tapering. Probably the most obvious application is weight reduction, over the whole part or over only certain areas.

Sometimes it is necessary to make a part heavier than is really required—because of the operations involved in making it. One example is in the production of centrifugal impellers for air compressors. These impellers are very thick in the region of the shaft so they can withstand centrifugal loads. Then, to provide proper cooling during casting, the rest of the wheel has to be designed thicker than needed for its own loads. This increased weight increases the loads on the wheel, shaft, and bearings. However, with chemical milling, the excess material can be removed from the wheel after casting. All loads can thus be greatly reduced and the safety factor of the wheel increased.

Chemical milling also offers a way to reduce costs by reducing the total number of parts in a product. There are many openings for this type of simplification in the automobile industry.

For example, fairly thin sheet-metal panels are now used for the hood and trunk lids of automobiles, but separate stiffeners have to be added to provide the required rigidity. And to keep the lid from being too heavy, the stiffeners have to be made from specially designed sections with lightening holes. Furthermore, extreme care must be taken when the lid and the stiffeners are welded together to be sure the whole assembly does not warp.

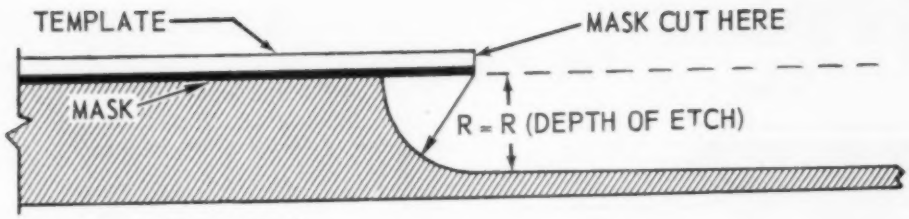
To produce this same lid with the help of chemical milling, it would first be formed out of stock that is thinner than the combined thickness of the present lid skin and the stiffener. Then, the underside would be milled in such a manner as to provide stiffening ribs in the desired locations. This lid would certainly be superior to the lid that is manufactured in the present fashion.

THE ECONOMICS OF CHEMICAL MILLING

If an operation can be performed easily by a machine tool, chemical milling probably should not be considered. But one of the real advantages of the process is its ability to mill many parts at the same time. The number is limited only by the size of the tank. This important factor has been largely neglected up until now, because most applications have been on aircraft and missile parts where short runs are the rule.

Another important point to be remembered is that, even when chemical milling is more expensive than machining, there may be savings through simplification and easier assembly that will result in a lower overall cost. The advantage of chemically milling a part must be judged with respect to all the manufacturing operations involved.

Chemical milling is a new manufacturing tool, and just as with any other new tool, it requires a learning period before it can be employed most effectively. However, once this learning period is completed, engineers will find that they can adopt the process as an integral part of manufacturing operations.



Chemical milling eats back . . .
under masking just as far as it eats down into the metal. Template dimensions must allow for eat-back

CHEMICAL MILLING: where and how

2. How to do chemical milling

KEN CLARK, manufacturing project coordinator,
CONVAIR (SAN DIEGO), DIV OF GENERAL DYNAMICS CORP

Because of the many variables in this new process, the operations have to be planned and executed carefully. Here is how Convair worked out the techniques for etching the wing-tip panels for the F-106A

Chemical milling has been something of a "wonder process" in the aircraft industry, especially in the precision removal of metal from critical areas of contoured parts. But its success depends upon close attention to details at all stages of the operation.

At Convair, the research and development work in this field was stimulated by the F-106A wing tip. The wing tip for the earlier F-102A was a conventional sheet-metal construction requiring 56 detail parts, but the new wing tip was to be twice as large. However, chemical milling has made it possible to build the larger one with only 26 parts. In addition, it is three times as strong and actually weighs four pounds less than the smaller one.

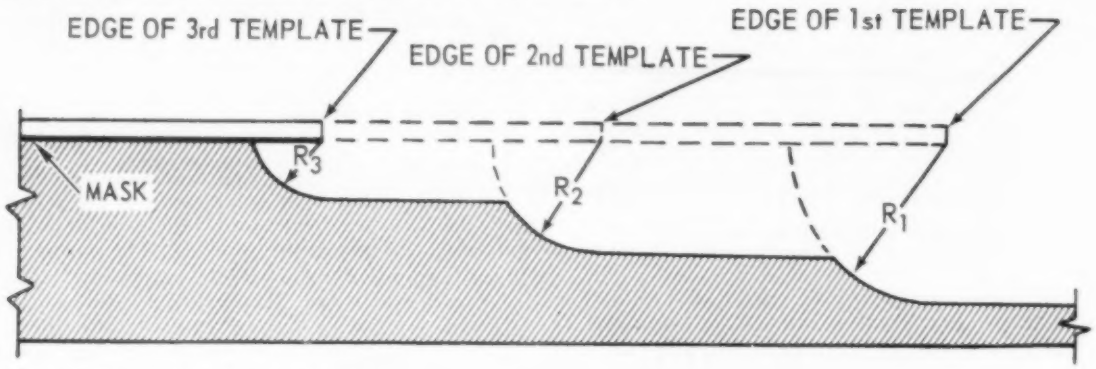
The skin is made of ¼-in. aluminum (7075) with a 2½-in. grid spacing at 45°. The webs are only 0.040 in. wide, and the material between them is etched 0.210 in. deep, leaving 0.040 in. effective skin thickness. It was found practicable to hold the web tolerance to −0.010, +0.030 in. On smaller parts, the plus tolerance can be reduced even more. Tests showed that a tolerance of ±0.005 in. can be held on the 0.040-in. skin thickness. Typical fillet radiuses at the web are 0.210 in. for the skin areas and 0.170 in. for rib pad areas.

PROCEDURES

The ability to achieve this control depends on the care and precision with which personnel follow a well-planned procedure. For instance, white gloves are used to handle the material after it is cleaned and before it is masked. Time intervals and temperatures are closely watched during treatment of the material with solutions. Before trimming, the maskant is electrostatically checked for pin holes. When the mask is trimmed to a templet, a surgical scalpel is used with an exact, continuous movement to minimize inaccuracies from overlaps and mismatches, and the work rests on a rotary table top to facilitate a smooth scribing operation.

Compounding and handling of maskant and etchant solutions follow good chemical-laboratory procedures in the shop. The maskant is primarily neoprene with a resin base. For aluminum, the etchant is made up of approximately 14 oz of Oakite No. 130 per gallon of solution. This etchant is about 86 to 90 parts caustic, and the balance is wetting, sequestering agents and special chemicals that preferentially attack the alloy constituents.

Solutions are tested daily for pH and specific gravity. Shop instructions are to titrate the solution whenever necessary. The etchant is kept fresh and at the right temperature (205 F, max). To replenish, the tank solution temperature is reduced to 120 F. Major additions are made at least an hour prior to use, although small additions may be made between loads of parts. Test coupons are used daily, and the solution is dumped when deposits of aluminates have too great an effect on the etched surface smoothness, or when the pH adjusts too slowly.



Fillet radius equals depth of cut . . .
In step milling, eat-back allowance must be figured separately for each step

Wing-tip panel is scribed . . .
to templet after maskant is applied to entire surface of part. Templet, segmented for easier handling, is located by pins in tooling holes

VARIABLES

The rate of etching depends upon such factors as direction of grain, alloy, previous heat treatment, and whether the material is clad or bare. It is also affected by such variables as time, temperature, agitation, angle of immersion, and spacing of parts in the bath.

When these variables are properly controlled, the aluminum etch rate is one mil (0.001 in.) per minute in all directions from the exposed surface of the metal. Under such conditions, all the variables, which are summed up in the expression "etch factor," have a negligible effect at etch depths up to 0.125 in. With adequate control, it is realistic to hold tolerances within the following limits when etching aluminum:

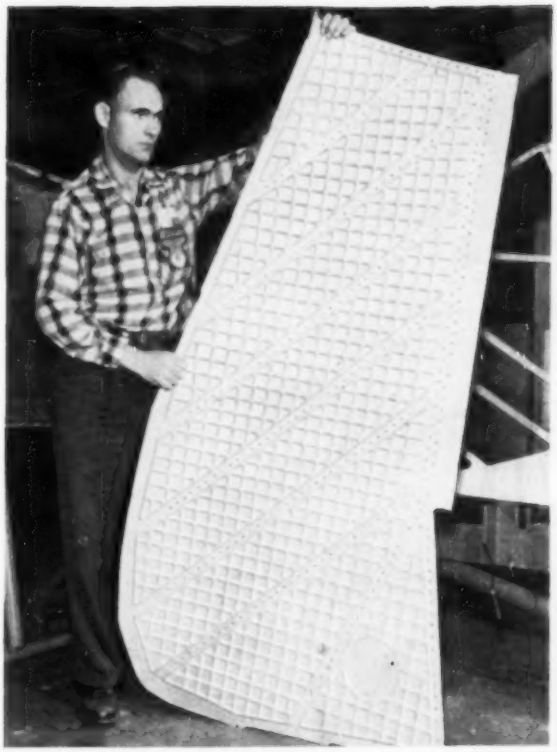
Depth	Tolerance
to 0.030 in.	±0.002 in.
0.031 - 0.060 in.	±0.0025 in.
0.061 - 0.090 in.	±0.003 in.
above 0.090 in.	±0.004 in.

Because the etchant removes metal at approximately an equal rate in all directions, the maskant must extend onto the etch area for a distance equal to the total depth of the etch. This allowance is called "eat back."

If a part has several etch depths, it is necessary to unmask the deepest area first and then to unmask the other areas at time intervals proportionate to the differences in depth. This progressive removal of masking is called "step etching," and the radius evolved, as well as the templet allowance, is based upon the total depth of each cut, not upon the differences in depth, as illustrated in the sketch at the top of this page.

At the same time that the ionized elements in the etchant oxidize the metal and form a soluble salt, there is also a release of hydrogen gas. If this released gas is trapped on the surface of the metal being etched, it tends to keep the solution from the metal, and the etching process slows down and may even stop.

For this reason, the position of the part in the solution is very important. Thus, the etched surface should be uppermost, and, if the part is heavily



Panel is ready for assembly . . .
into F-106A wing tip. Even though twice as large as F-102A wing tip, this one is lighter, stronger, and requires fewer parts

contoured, it may be necessary to mask and etch various areas individually to avoid discrepancies in etch rate due to position. Improper position may also cause entrapment of gas under the edge of the maskant with a resulting uneven fillet radius. Vertical positions for etch depths greater than 0.060 in. should be avoided if possible.

The chemical action of etching generates heat. Because a small area can quickly dissipate heat to the relatively large surrounding mass of metal, small areas etch more slowly than larger areas where the temperature tends to rise as heat accumulates. Close stacking of parts in the bath also generates heat to the point where it may affect the etch rate even with agitation. Gas entrapment is another hazard to close stacking. For these reasons, parts should be spaced 1 to 6 in. apart in the bath, depending on their size and shape.

After considering all these factors and providing for close control over the process, Convair established the accompanying lineup of operations to make sure that good parts would be produced consistently.

Operations

1. Hand wipe with clean rags and diluted solvent.
2. Vapor degrease with trichlorethylene.
3. Alkaline clean for 15 min in Aviation Cleaner.
4. Rinse—5 min at 110 to 120 F (spray parts as removed from tank).
5. Deoxidize—10 min in chromic deoxidant.
6. Rinse—cold water (spray parts as removed).
7. Dry—5 to 10 min at 200 F max (oven or infra-red).
8. Mask—Spray or dip. Dry at 180 F max (air or infra-red) between coats.
9. Cure—1 hr at 210 F max (oven or infra-red). Increase time proportionately for deeper cuts and thicker coatings
10. Trim to die or templet and strip the cut-out by hand.
11. Measure and rack parts.
12. Metal removal—immerse in caustic etchant solution at 195 F ±5 F long enough to dissolve indicated metal. If part is to be tapered, lower in solution at required rate.
13. Rinse—cold water (spray parts as removed).
14. Brighten—3 to 5 min in chromic deoxidant.
15. Rinse—cold water spray.
16. Trim (if step etch)—cut mask along templet lines and repeat operations 12 through 15.
17. Strip mask— 30 to 40 min in stripper followed by high pressure water or steam, or strip by hand after soaking 5 min in hot water.
18. Dry—2 min in oven at 200 F max.

Round Table...

Sorehead

"Ever want to get somebody fired, even if he wasn't in your department, Ed?"

"Sure, Al. But it never did me much good. Who's giving you trouble now?"

"It's Harry Rodgers, indirectly. My boys keep getting into arguments and fights with him, and I know damned well it's mainly because he picks the fights. I've even listened in on a few. He's just a natural troublemaker."

"I guess you don't know why he's so troublesome, Al. You weren't here when he was a machinist in your department."

"I didn't know that."

"Well, he got himself elected president of the union local, and naturally he quit to handle that work. Our contract with the union has a clause that says any union officer can come back to work with no effect on his seniority, so when he got booted out some time ago he got that job in the toolcrib. His old job was eliminated."

"Why should that make him so bitter? He's got a fairly good job now."

"I know; but he was really riding high as president of the union, and it went to his head. Then the union voted him out—and he has a pretty good idea who pushed him out—it was some of the boys in your machine shop who got tired of his bigheadedness and got out the vote."

"Oh, now it makes sense. He's getting back at them for cutting him out of a soft job by making trouble, is that it?"

"Sure. I'm not positive it was such a soft job as union president, though. He worked hard, as I remember. But it hurt his ego, and now he's mad at everyone who voted against him."

"Well, if everyone knows about it, why doesn't somebody in authority tell him to cut it out or get out?"

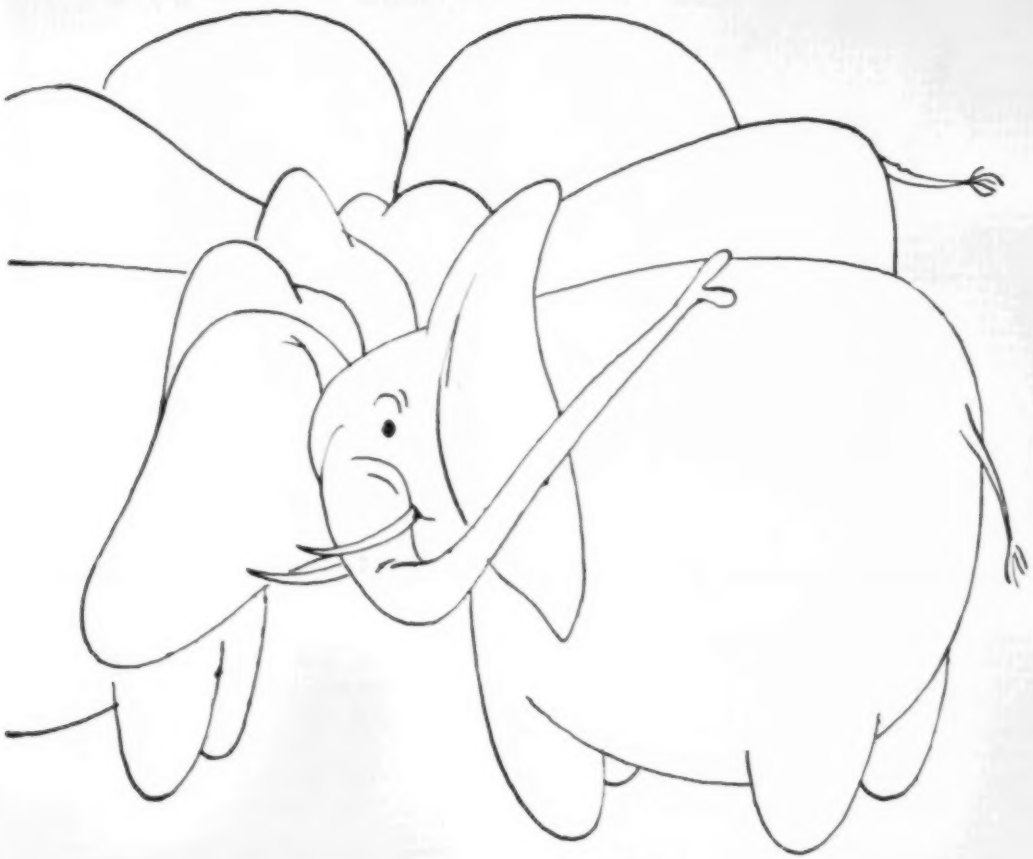
"I don't know, Al, but you'd better not. That's mostly up to his foreman, not you."

"It's a bad situation, Ed."

• • •

***HOW** can a plant rid itself of troublemakers, or must it just get along with a few? Your opinions on how to handle this situation may help others. Discussions of earlier topics start on page 180.*

something big on the move



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Bonded Diamond Wheel
7" Dia. ½" Width

TABLE FEED	DEPTH OF CUT	D.C. AMP DRAW	SOURCE VOLTAGE	GRINDING VOLTAGE	AMC VOLTAGE SETTING	SUPP SPEED SETTING	SPINDLE NO LOAD	SPINDLE LOAD	MATERIAL	VOLUMETRIC REMOVAL
¾"/MIN	.040	210	12	12	55	55	2.3	3.7	KENAMETAL K1 CARBIDE	.075 CU. IN. MIN.
1¼"/MIN	.020	170	12	12	55	55	2.3	3.7		.075 CU. IN. MIN.
2"/MIN.	.010	200	9	9	55	55	2.3	4.0		.075 CU. IN. MIN.
1"/MIN.	.040	290	10	9	50	50	2.3	3.5	ATD CARBOLOY	.100 CU. IN. MIN.
2"/MIN.	.020	230	10	9	50	50	2.3	3.6		.100 CU. IN. MIN.
4"/MIN.	.010	200	9	9	50	50	2.3	4.0		.100 CU. IN. MIN.
1"/20 SEC.	.020	250	11	10	86	77	2.3	3.8	CARPENTER STENTOR	.200 CU. IN. MIN.
1"/40 SEC.	.040	300	13	12	97	77	2.3	3.2	H.S.S. ROCKWELL 55C	.090 CU. IN. MIN.

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Fusion Welding of Titanium—I

Source: Titanium Metals Corporation of America

Weld efficiencies of 100% can be produced in titanium alloys by using shielded-arc procedures. These include the non-consumable (tungsten-arc) and consumable (sigma) electrode processes.

Molten and hot titanium must be protected from air by argon, helium, or a mixture of these gases. Titanium in the molten state is highly reactive with most materials, including refractories. Weld areas must be free of dust, grease and other contaminants. Coated electrodes and fluxing compounds cannot be used.

Any fusion welding cycle reduces the ductilities of certain highly heat-treatable titanium alloys to levels below those required for most applications. Some commercially available, weldable alloy grades and their minimum room temperature properties are listed in Table 1. Titanium does not weld satisfactorily to other metals.

Table 1—Mechanical Properties of Weldable Titanium Alloys†

TMCA GRADE DESIGNATION	Sheet & Strip		Bar	
Ti-55A	Yield Strength	= 45,000 Psi	Yield Strength	= 45,000 Psi
	Tensile Strength	= 55,000 Psi	Tensile Strength	= 55,000 Psi
	Elongation, 2"	= 22 Pct	Elongation, 1"	= 20 Pct
	Sheet Bend, 105°	= Under 0.070"—2T	Reduction of Area	= 35 Pct
		Over 0.070"—2.5T	Hardness	= 200 Bhn max
Ti-65A	Yield Strength	= 55,000 Psi	Yield Strength	= 50,000 Psi
	Tensile Strength	= 65,000 Psi	Tensile Strength	= 65,000 Psi
	Elongation, 2"	= 20 Pct	Elongation, 1"	= 20 Pct
	Sheet Bend, 105°	= Under 0.070"—2T	Reduction of Area	= 35 Pct
		Over 0.070"—2.5T	Hardness	= 225 Bhn max
Ti-75A	Yield Strength	= 70,000 Psi	Yield Strength	= 60,000 Psi
	Tensile Strength	= 80,000 Psi	Tensile Strength	= 70,000 Psi
	Elongation, 2"	= 15 Pct	Elongation, 1"	= 20 Pct
	Sheet Bend, 105°	= Under 0.070"—2T	Reduction of Area	= 35 Pct
		Over 0.070"—2.5T	Hardness	= 265 Bhn max
Ti-100A	Yield Strength	= 80,000 Psi	Yield Strength	= 70,000 Psi
	Tensile Strength	= 95,000 Psi	Tensile Strength	= 80,000 Psi
	Elongation, 2"	= 15 Pct	Elongation, 1"	= 15 Pct
	Sheet Bend, 105°	= Under 0.070"—3T	Reduction of Area	= 30 Pct
		Over 0.070"—3.5T	Hardness	= 295 Bhn max
Ti-6Al-4V	Yield Strength	= 120,000 Psi	Yield Strength	= 120,000 Psi
	Tensile Strength	= 130,000 Psi	Tensile Strength	= 130,000 Psi
	Elongation, 2"	= 10 Pct	Elongation, 1"	= 12 Pct
	Sheet Bend, 105°	= Under 0.070"—4.5T	Reduction of Area	= 30 Pct
		Over 0.070"—5T	Hardness	= 36 R_c max, <2"
Ti-5Al-2.5Sn	Yield Strength	= 110,000 Psi	Yield Strength	= 110,000 Psi
	Tensile Strength	= 115,000 Psi	Tensile Strength	= 115,000 Psi
	Elongation, 2"	= 10 Pct	Elongation, 1"	= 10 Pct
	Sheet Bend, 105°	= Under 0.070"—4T	Reduction of Area	= 25 Pct
		Over 0.070"—4.5T	Hardness	= 36 R_c max
Ti-3Al	Special Low-Alloy Filler Wire			

† Titanium Metals Corp of America

PRECAUTIONS IN WELDING

The root of the titanium weld, as well as the weld face, must be protected from air. This is accomplished with inert-gas backup shielding or, in certain cases, by placing a water-cooled copper bar flush against the underside of the weld joint.

POWER SUPPLY

The recommended power supply for tungsten-arc welding of titanium is dc straight polarity. The negative electrode operates cooler than the positive weld joint, enabling a small electrode to carry high current densities. This results in the deepest weld penetration and narrowest bead.

Reverse polarity is used for consumable-electrode welding. In this case the hotter positive electrode insures complete fusion of the wire in the weld joint. An ac power supply with a super-imposed high-frequency component has been used in some cases, but weld uniformity has never been as good as with dc power.

For tungsten-arc welding, a machine with fine control adjustment and good stability in the lower current ranges is desirable, especially for welding thin-gage material. Rectifier units are recommended because a current variation of 5 or 10 amp may mean the difference between a good weld and a burn-through.

The machine with a constant potential or slightly rising load characteristics gives improved arc stability and more uniform wire burn-off when welding with the consumable-electrode process.

NON-CONSUMABLE ELECTRODE WELDING

The tungsten-arc, inert-gas-shielded process is the most widely used method for welding titanium. It is used almost exclusively on sheet materials up to 0.125 in. thick. It also can be employed successfully on gages up to 0.250 in.

Tungsten-arc welding can be

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Fusion Welding of Titanium—II

accomplished by both manual and automatic techniques, with or without filler material. Penetration and width of the fusion zone may be controlled accurately. There is no spatter. Weld appearance is smooth and uniform whether or not filler is used. One disadvantage is the possibility of tungsten contamination of the weld during manual operation.

Thoriated tungsten electrodes are recommended. These electrodes produce greater arc stability, exhibit superior arc-starting characteristics, and operate cooler for a given current density than pure or zirconiated tungsten electrodes. Generally, a 1/16-in. electrode is satisfactory for the entire range of titanium sheet gages. Centerless-ground electrodes give the best arc stability, and tapering the points improves arc starting characteristics as well as control of the physical dimensions or spread of the arc.

The electrode should be centered in the nozzle to provide the arc zone with uniform gas shielding. Extension of the electrode below the nozzle is generally 1½ times the electrode diameter for butt-welded joints. In the case of fillet welds the electrode is sometimes extended as much as ½ in.

CONSUMABLE ELECTRODE WELDING

Shielded-inert-gas, metal-arc (sigma) welding, which employs filler wire, is recommended for heavier gage materials. The process is successfully used for butt-welded joints on gages as light as 0.125 in. and for some fillet welds on gages near 0.060 in. Sigma welding deposits more metal per unit of time and unit of power consumption, and minimizes the number of passes. Disadvantages are excessive spatter and the need for optimum insert-gas shielding.

FILLER WIRE

Use of filler wire with tungsten-arc welding can increase the possibility of contamination, if the wire has not been thoroughly cleaned or if the hot end is exposed to air during intermittent deposition of metal in manual welding.

It is generally good practice to use a filler wire of the same composition as the base metal, but there are cases where a different grade may give better joint properties. One example of this is the welding of Ti-6Al-4V. Here, increased joint ductility can be obtained without significant loss in weld strength by using a commercially pure grade such as Ti-75A or the low alloy grade, Ti-3Al for the filler material. The filler-wire size recommended for side-wire feed attachments is generally the largest diameter which can conveniently be inserted into the weld puddle without "freezing out" or striking the gas nozzle or electrode.

INERT-GAS SHIELDING

Much of the early welding of titanium was carried out in inclosed chambers under a complete blanket of inert gas. Newer developments, especially in shielding techniques, allow the welding of titanium outside a chamber. Small parts and complex weldments, which are difficult to shield adequately, may still be welded more easily and economically inside a purge chamber.

For the most part, "open air" welding is adaptable to production operations. It is accomplished through the use of inert-gas shielding of the tungsten or sigma arc regions with a combination of inert-gas trailing shields and inert-gas back-up shielding. The weld puddle and adjacent heat-affected zones on the face of the weld are protected by the nozzle gas (primary shielding), the trailing shields are used to protect the hot solidified metal and heat-affected zones behind the weld puddle.

HOTTER ARCS

Helium-shielded arcs operate at higher arc voltage for a given current and are hotter than argon-shielded arcs. Greater weld penetration and faster welding speeds are secured for applications involving long seam welds and heavy plate sections. However, the hotter helium-shielded arc is less stable than the argon arc, requires more operator skill, more accurately controlled weld settings, and better fit-up to prevent burn-through and weld irregularity. When used for primary shielding, greater gas flows are required for helium because of its tendency to rise from the face of the weld, but its low density is an advantage when used as the back-up shielding gas on the underside of welds.

Argon is preferred for the nozzle gas in manual tungsten-arc welding. Speed is not the important factor, more can be gained with a stable arc and the heavier blanket of shielding gas. In machine welding of sheet gages, argon is also preferred because slight fluctuations in welding variables can be tolerated to a greater extent than with helium.

Combinations of the two gases involve using argon at the face of the weld and helium on the underside to take advantage of their respective densities and arc

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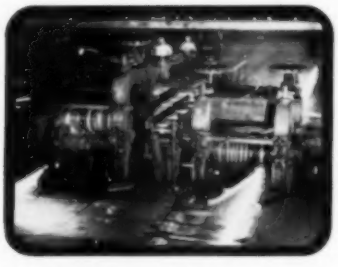

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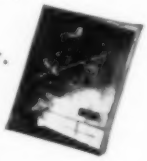

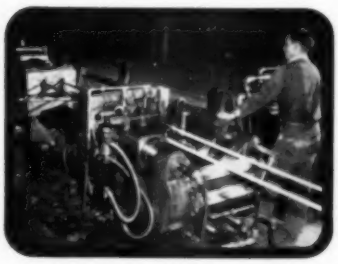

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Fusion Welding of Titanium—III

characteristics. Mixtures of the two gases are often used for the primary shielding. A mixture of 75% argon-25% helium produces an arc having the stability characteristics of a pure argon arc but gives a better-shaped weld deposit. Mixtures do, however, range from 10% to 90% of either gas. Those with high helium content are often used for consumable-electrode welding.

PRIMARY SHIELDING

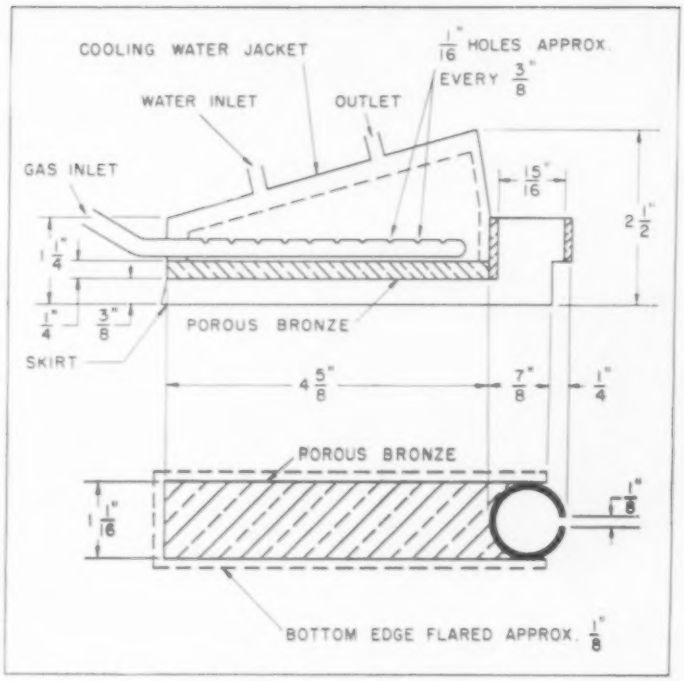
Titanium welding requires larger gas nozzles. For titanium, a 9/16-in. nozzle is generally used with a 1/32-in. tungsten electrode; while a ¾-in. nozzle is recommended for a 1/16-in. electrode. For sigma welding of plate sections, nozzles with 1-in. ID are employed to insure adequate gas coverage. For fillet welds, it is better to use a large nozzle and extend the electrode up to ½-in. beyond it, rather than use a smaller nozzle with shorter electrode extension in order to get closer to the joint.

Nozzles may be ceramic, radiation-cooled metal, or water-cooled metal. The last are generally required when the weld current approaches 250 amp.

TRAILING SHIELDS

Trailing shields cover the weld area with an inert-gas blanket for several inches behind the weld puddle. Shields may be mounted on manual, semi-automatic or automatic electrode holders or guns.

An example of a trailing shield for welding sheet and plate with semi-automatic or automatic equipment is shown. This shield was designed for use on ⅝-in. nozzles. The gas is bled through small ports on the top side of the gas-inlet tube. If the gas ports were on the bottom side of the tube, or if the gas were released directly into the chamber, an uneven gas flow through the porous bronze diffuser would result.



1— A trailing shield covers the molten and hot areas behind the weld with a blanket of inert gas to prevent embrittlement by absorption of oxygen and nitrogen from the atmosphere

The porous bronze diffuser cushions the gas flow over the weld, providing a soft uniform distribution. A skirt on the outside of the shield extends about ⅜-in. below the diffuser. The bottom edge is kept in close proximity to the weld to minimize turbulence from atmospheric breezes and to confine the inert-gas to the weld zone.

BACK-UP AND CHILL BARS

Back-up support and protection are essential to a titanium welding setup. Where rapid cooling is desirable, the back-up may be water-cooled copper or simply a massive piece of copper. If slower cooling rates are desired, the back-ups are made of stainless or mild steel.

For optimum shielding of the weld root, backup bars should be grooved. The groove is centered beneath the weld joint to provide a passage for inert-gas flow. For material thicknesses up to 0.050 in., the groove should be ¼ in. wide by 1/100 to 1/16 in. deep. For thicknesses from 0.050 to 0.125 in., the groove should be ⅜ in. wide by 1/16 in. deep with an additional groove at the center measuring 3/16 in. wide by 1/16 in. deep. As material thickness increases and joint design changes from a simple square butt, the groove size should be scaled upward.

To be continued in an early number.

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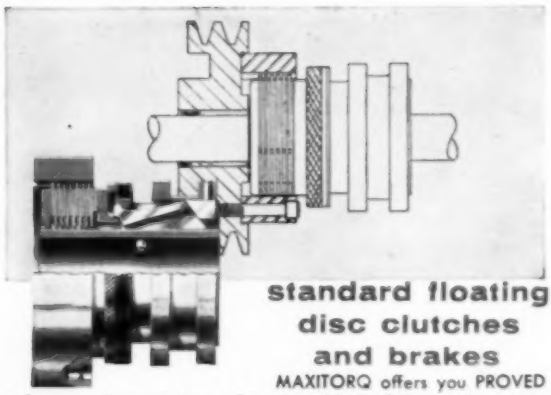

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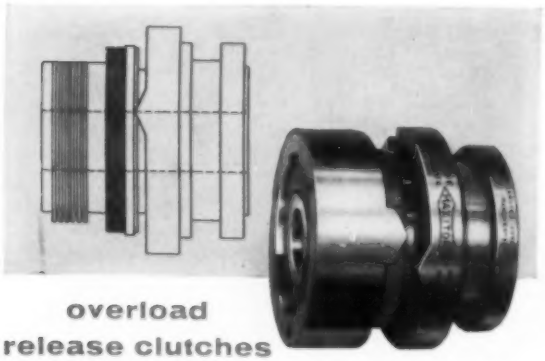

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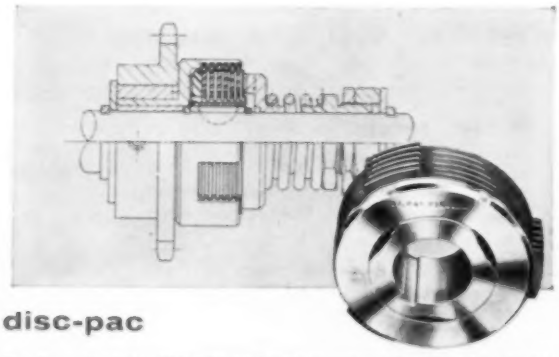

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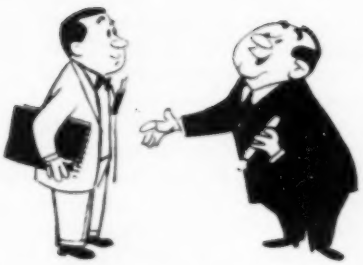


Meeting Your Public

SOME POINTERS on dealing with the press were cited recently by Ed Logelin of U S Steel in a talk to the Midwest Stock Exchange. Based on a survey of financial writers he offered these "Don'ts."

1. Don't feel that the publisher's office is the best way to approach an editor.

2. Don't try to make friends on the editorial staff by asking the advertising department to intervene with them.

3. Don't have local press relations handled by an agency in a distant city.

4. Don't look upon your relationship with the press as a social affair —at least during working hours.

Then he added some "Do's" to the list.

1. Do make all your press material factual and dependable.

2. Do pay attention to the mechanics of news coverage, delegating them to someone with knowledge of the subject if necessary

3. Do retain a consultant if you wish to, but don't assume you can delegate responsibility for corporate policy to him.

4. Do play fair with the press. Don't take the results of an inquiry from one reporter and give it to another.

5. Do have someone available to answer questions and clarify statements when they are made.

6. Do make it clear who is responsible for public relations policy in your company.

All these points were aimed directly at your dealings with the financial editors of newspapers, but the points are valid for all press relations.

Templet Maker

A PROTOTYPE numerical control unit developed by Farnham has been in use since last May cutting templets for spar mills. In this time more than 15,000 lineal feet of templet have been produced. The system includes an Interpolator-Recorder for making the magnetic tape and a playback unit on the machine. Data processing and recorder programming are handled with a standard desk calculator. Farnham developed the system and applied it to a spar mill by replacing the templet follower assembly with a step motor and adding a selsyn to the carriage-drive unit. The unit is said to have doubled machine output and improved tolerance control.

Retort Discourteous

THERE ONCE was an Englishman, a metallurgist, talking to a couple of American visitors who described himself as a "metalist"—at least that is how it sounded to his listeners. So one of them asked him what it was he knew that qualified him as a "metalist." The Englishman told him, rather 'aughtily that, "I can distinguish between a platinum blonde and an ordinary ore."

Obsolescence

IS THE "ANNUAL MODEL CHANGE" a realistic way to maintain a market? Henry Dreyfuss says no. Although he resents being asked to buy something because it is bigger and brighter, he opposes planned obsolescence because it is an unsound principle in his opinion. First because it creates purchasers inclined to wait for next year and second because it puts the emphasis on improving the package and not the product. Ultimately, it is the *better* mousetrap, not the flashier one, that pays off.

How's That Again?

IN *Scientific American* 50 years ago: "That the automobile has settled down to its approximate final type is suggested by the small and decreasing number of novelties which have made their appearance during the past year."

Apprentice Lag

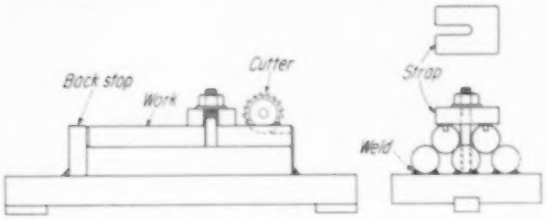
NUMBER OF APPRENTICES now in training in the US is said to be 260,000, and that isn't enough to replace journeymen who will retire or die next year. A study at the University of California shows that the Soviet apprentice training program has been a big factor in the gain in output there.

Missile Threads

A MISSILE COUPLING ring is being made of 4140 steel and aluminum. The parts are being thread milled with a 19.4 in. pitch diameter at a rate of 20 min. for the aluminum parts and 69 minutes for the steel parts. Plain HSS cutters with multiple teeth are used. George Wendall, of Wickes, tells about the operation which required a special spindle on the thread mill.

Practical Ideas...

Inexpensive Milling Fixture Made From Bar Stock

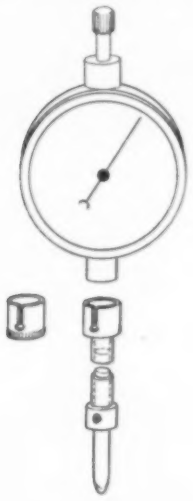


Each of a good number of shafts we had produced required a keyway at one end. Conventional work-holding methods allowed us only one shaft to be machined with each pass of a cutter. This was too slow, so we set out to build the illustrated fixture which permits two shafts to be milled at once. The two cutters were assembled on a horizontal arbor, spaced by a precision sleeve.

Three lengths of bar stock (drill rod or similar material having a good finish should be used) are welded to a surface-ground baseplate. These are precisely aligned with the keys secured to the underside of the plate.

A stop is then welded to the back end of the fixture to position the shafts and also to take the thrust during machining. A stud is screwed into the center bar for clamping purposes. It should be located as near the end of the cut as the clearance between the clamp and cutter will allow. A finger clamp makes for faster loading and unloading.

Roger Isetts, Kenosha, Wis



Pin Gage Incorporates Indicator

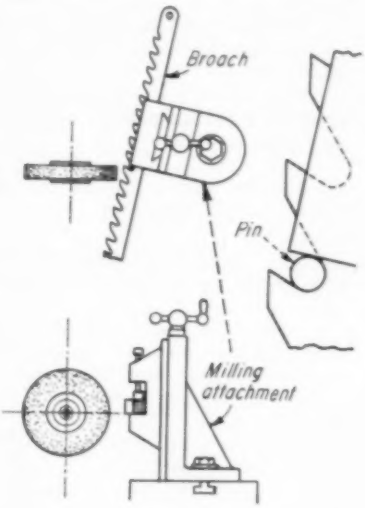
One of the goals of a tool designer is to keep inspection gages simple and easy to use. This is not always easily accomplished, particularly where bore diameters are many and varied.

The dial-pin gage shown is our solution to such a problem. It permits us to quickly check a bore, and when diameters vary only slightly the capacity of the indicator will be sufficiently large to check more than one bore with the same rod. When diameters differ beyond the capacity of the indicator, other length rods are quickly slipped on.

The transformation from a plain dial indicator to a dial pin gage is simple. The dust cover on the indicator is first removed. And an adapter is then made to fit the hub. The other end of the adapter is fitted with a rod of approximately the same diameter as the indicator spindle.

On larger-than-average diameters, it may be desirable to make the rod of heavier material for more rigidity. When the rod, adapter, and indicator are assembled, the indicator is set to read zero with the aid of an outside micrometer adjusted to size.

William Gardiner, Toronto, Canada



Cylindrical Grinder With Milling Attachment Sharpens Broaches

A number of broaches from a keyseating machine needed resharpening, but we had no suitable grinder in the shop. Being pressed for time, we had to come up with a way of improvising. The following method did a good job, and has later been used to sharpen woodworking knives and similar tools calling for a straight-line edge.

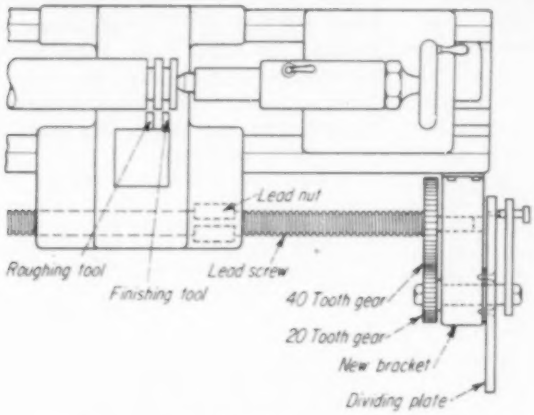
A small lathe-milling attachment was mounted on the table of our cylindrical grinder. The angle at which the attachment faces the grinding wheel must be the same as the tooth-clearance angle required.

Tooth location in relation to the grinding wheel was controlled by a stop mounted on the table of the grinder. A pin between broach tooth and vise jaws indexed each tooth for sharpening.

With the teeth thus located,, the grinder wheel was brought in to the clearance face of each tooth. Gross-feeding was done by operating the vertical feed of the milling attachment. If more than just a touch is necessary, equal amounts must be removed from all teeth.

Edward H Johnson, Grand Junction, Colorado

Carriage Advanced With Dividing Head Accuracy



When we recently had to machine grooves into a number of 9 in. dia rollers, we had difficulty in holding the close tolerances required. On the width of the grooves the limits were +0.001/–0.000 in. On the solids they were +0.000/–0.001 in. with no accumulation of overall tolerance.

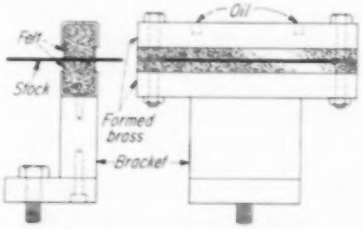
Although we used a new heavy duty lathe, and carefully advanced the carriage with the aid of size blocks, it was long and tedious work without satisfaction. After studying other possible methods we decided to employ the dividing-head principle.

The support-bearing bracket at the tail end of the lead screw was replaced by a two-bearing bracket. One of the bearings was located in the same relative position as the original support. The second was oriented to properly mesh a 40-tooth gear with a 20-tooth gear.

The 40 gear was secured to the lead screw, inside the bracket, while the 20 gear was fitted to a stub shaft. A suitable dividing plate was centered on the outer bearing and secured the back end of the bracket. The free end of the stub shaft then received a crank handle, similar to the ones used on dividing heads.

After fitting the toolholder with a roughing and a finishing tool, it was a simple matter to advance the carriage from one station to the next. Thanks to an accurate lead screw and the dividing arrangement, divisions were within limits, and the saving in labor was over 50%.

Joseph Bonnafe, Wilmington, Mass



Felt Oilers Improve Lubrication

Our past method of manually lubricating stock as it is fed into our dies proved to be ineffective and wasteful. While a lot of oil was being used, some areas would still be dry. As a result, we had many rejects, and there was always a danger of damaging the drawing section of the die. Oiling by this method also became very tedious, especially on dies that were automatically fed.

It was for these two reasons that we devised the illustrated felt oilers. They not only apply an even film of oil to the stock, but they also do a good job of clearing the material of dirt.

Two long brass boxes were made to fit the outside dimensions of the felt. Their length should be approximately an inch longer than the width of the material to allow room for a screw at each end.

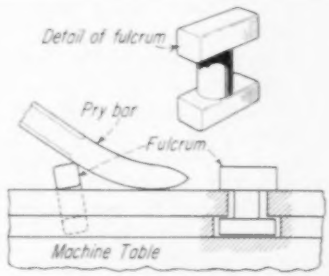
The bottom box was secured to an angle bracket with two machine screws. The height of the bracket will depend on where it will be located, which might be on the die set or the bolster plate of the press. Two holes drilled through the top provide access to the felt for oil injection. Both felts should be well saturated before the material is inserted.

James E Carey, Fairport, N Y

Work Handling Made Easier With T-Slot Fulcrum

Moving and positioning heavy castings on T-slotted floor plates, or large machine tables, is a pry-bar operation. That there usually is no dependable fulcrum on which to pry against, makes this job unecessarily tough.

To bolt a fulcrum block to the table, or set one against pins inserted in the table, is time consuming and often impractical. Loose blocks, used as fulcrums, may slide and are therefore dangerous.



These drawbacks can all be eliminated by employing a T-slot fulcrum like the one shown in the drawing. It is simply dropped into a slot and given a quarter turn. Leaning it away from the work jams it top and bottom.

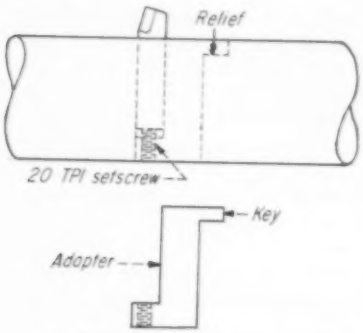
Made from rectangular CR steel, a central portion is turned to produce a key at one end and a fulcrum head at the other. The key must be short enough to permit its rotating in the T-slot. The top is slightly rounded for better contact with the bar.

Buckley Sullivan, Shaker Hts, Ohio

Practical Ideas...

Boring Tool Adjustments Made Easier With Adapter

A great deal of experience is required of an operator running a horizontal boring mill. This fact is particularly true when adjustments of cutting tools, set directly into the boring bar, have to be made. The deft hand necessary in moving the tool to produce a desired diameter is only achieved through practice.



The drawing shows the method we have adopted to make this job simpler. It is an adapter with a setscrew for tool adjustment which is fitted into an enlarged tool hole.

The tool hole is first extended longitudinally. Square corners are not necessary; if the extension is drilled out, the radius may be left as is. A relief is then milled into the top of the bar for the adapter key.

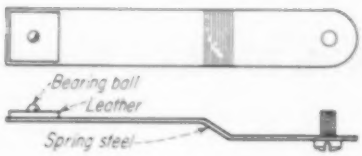
When all blending and smoothing out has been done, the adapter is made to fit the hole as shown. The overall length of the adapter is the same as the diameter of the bar, leaving no protruding edges.

The setscrew backing up the toolbit is a 20-tpi headless screw. This gives us a better-than-rough method of calibrating our tool advance. Each turn of the screw thus represents 0.050 in.

Ben Beal, Lubbock, Texas

End Play in Grinder Spindle Temporarily Removed with Spring

When a surface grinder has had a lot of use, its spindle will develop end play which only a complete



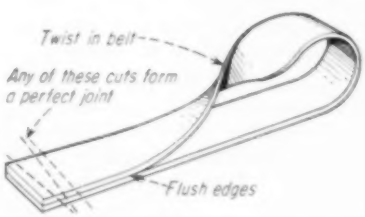
overhaul will permanently cure. This play causes the spindle and wheel to float, making side grinding with any accuracy difficult.

Because an overhaul is costly and also because of the time involved in making the overhaul, the job is often delayed. But there is something that can be done to remove the end play temporarily. We do it by putting a little spring tension on the end of the spindle.

The above sketch shows the way we arrange the necessary parts. A piece of spring steel is first drilled in one end to receive a mounting screw. The other end takes a small bearing ball imbedded in a piece of leather. This leather should be cemented to the spring to keep it in place.

The spring is then mounted in a convenient place on the wheel-guard housing so that the bearing ball seats in the center hole of the spindle.

James E Carey, Fairport, N Y



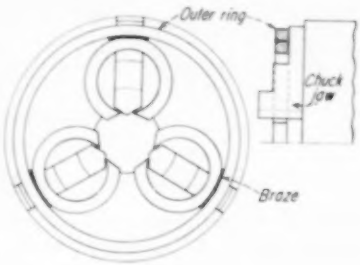
Belt Cutting Kink

Because we still have some machinery employing flat belts in the power transmission, we sometimes have to replace or relace them. Instead of using the conventional method of individually squaring the ends with the edges of the belt, we cut and match ends better and faster by the trick shown.

This method does not require that either or both ends be cut square with the edges. It is only necessary to make one cut after the ends have been suitably located. To preserve material, this cut should not be made carelessly but as square as possible.

One end of the belt is given a twist and laid on top of the other, keeping the edges flush. Then, by making one cut through the two layers of belt, even though it isn't square with the edges, the ends will match perfectly.

E Mayover, Bradenton, Fla



Jaw-Grinding Fixture Made From Pipe Rings

Many devices have been suggested for keeping the jaws in a three-jaw chuck under proper tension during regrinding. Most of these do a fine job although some are actually complicated in their construction and application.

The illustrated fixture is the result of our attempts to design one that would be easy to build yet reliable in performance. It is made from three small steel rings which are brazed inside a larger ring.

All rings are cut from available steel pipe. If the large size is not handy, a ring is rolled from flat stock and welded. The openings in the small rings can be cut after the weldment is completed. They may also be cut first and used to position the small rings in the larger, using the chuck jaws as guides.

No great accuracy is required as deflection of the ring takes place when the chuck is tightened.

In preparing for grinding, the fixture is applied to the jaws of the chuck as shown in the sketch. With the jaws slightly tightened, grinding is started at the smallest diameter.

M Barash, Prestwich, Lancs, England

AXEL KNUDSEN
Rocky River, Ohio

won $25 in addition to regular payment for his idea:

DIE EXTRUDES TUBE BENDS

in the Nov 18, 1956 isue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

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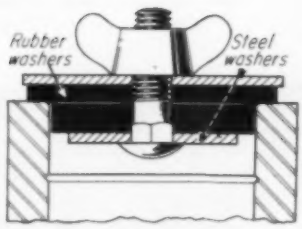
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Plugs Prevent Damage To Bushings

When work has to be done on the punch half of a die set, it is practically impossible to avoid getting chips, when drilling, or abrasive dust when sharpening, into the bushings. Stuffing them with rags isn't always effective, and once particles get into the oil grooves of the bushing, nothing short of a thorough washing will get them out. Should grinding dust or chips accidentally be left in a bushing, premature wear and possibly galling will result.

An efficient plug, which will give a double seal and will not be easily knocked out, can quickly be made. The only materials needed are some sheet rubber, plus two steel washers, and a bolt with a wingnut for each plug.

We cut our rubber washers from 3/16 in. thick 45 durometer neoprene. The diameter of the inside washer is approximately 1/64 in. smaller than the ID of the die bushing. The topseal washer is roughly ½ in. larger. The inside backup washer is anywhere from 3/16 to ¼ in. smaller than the bushing ID, while the outside must be large enough to completely cover the large rubber washer. When a plug is inserted into a bushing and the wingnut tightened, the inside washer expands and the top washer is pulled down, providing a two-way seal.

M Hicho, Cleveland, Ohio

Altered Centerdrill Removes Its Own Imbedded Drill Point

Center drills are generally used to produce a center hole in the end of a shaft or to accurately start a hole. Consequently, should a mechanic be unfortunate enough to break the drill point in the work, he has no other recourse than to remove it if he wants to retain that location.

To do this without destroying some part of the work is sometimes a tough job. Actually, it isn't too bad if you alter the remaining section to drill out the imbedded drill. It takes but a few minutes to modify the countersink and remove the broken-off piece the way we do it.

The body of the center drill is chucked for end grinding. With

a rubber wheel mounted in a surface grinder, a narrow slot is ground in the center of the two flutes. The depth of the slot should be equal to the length of the original drill and slightly wider. This converts the countersink part of the center-drill to an effective two-flute hollow mill.

Chucked in a drillpress and carefully drilling into the hole containing the broken point, the modified counterbore will cut around the drill point, maintaining the same center for starting a drill. The shell of material remaining around the broken piece can easily be peeled away with a sharp pointed tool, freeing the fragment of the original centerdrill.

William De Groat, Altadena, Calif

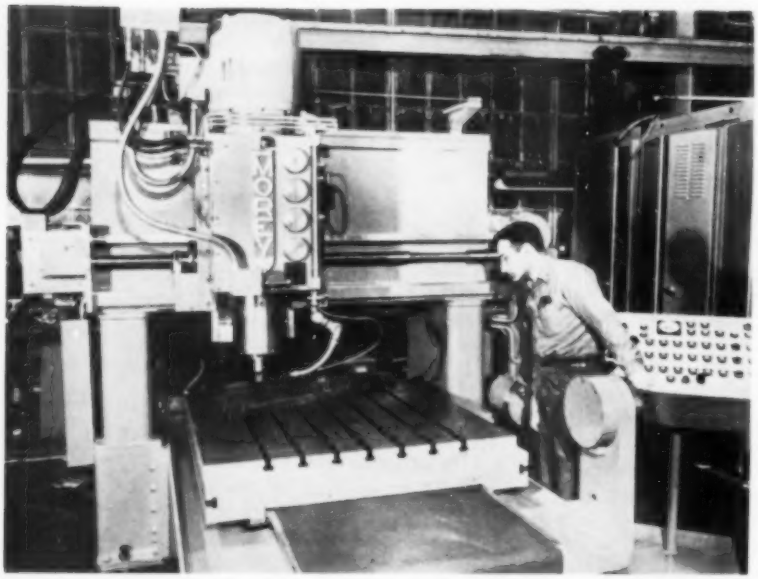
Tin Can as a Tumbling Barrel

It isn't often that we are required to do any tumbling, so a tumbling barrel is not part of our equipment. But when we do get a call to polish small metal parts by this process we have a simple inexpensive solution.

We load the parts, some sand, and a little kerosene into a tin can, preferably a square one. Chucked in a lathe, the can is rotated at a slow spindle speed until the rough edges and tool marks are knocked off. Then we finish off with abrasive grains in place of the sand.

H Muller, Danboro, Penna

New Shop Equipment



Morey Offers Numerically-Controlled Profile and Contour-Milling Machine

Newest entry into the field of numerically controlled machine tools is the Morey A-50 profiler, equipped for continuous-path, three-dimensional control, with the General Electric magnetic-tape control system. Built under USAF Air Materiel Command contract for Marquardt Aircraft Co, the first machine will be in production very soon. One of Marquardt's top tooling officials said that in machining templets alone the machine is expected to pay for itself in about one year.

The A-50 profile and contour milling machine, in addition to having numerical control, is a totally new machine. Many of the new features were designed to facilitate numerical control. For instance, the saddle is traversed (28-in. travel) by a precision ball-screw drive. A 30-hp, 3600-rpm, a-c induction motor provides a spindle speed range of 20 to 3600 rpm in 16 steps—through a new, quick-setting planetary transmission.

Spindle travel, vertically, is 12 in. Longitudinal table travel is 52 in. Both the table and the saddle provide feed rates from ¼ to 100 ipm; both rapid traverse at 200 ipm. The spindle feed can be varied from 0.0751 to 30 ipm and will retract at 60 ipm. Each of the three feed motors is a 3-hp, dc unit operating at 1150 rpm. And a new consideration where servo controls are involved—selsyn gearing is 0.1 ipr for each of the three feeds. Feed-drive control is with 35-kw amplidynes. Auxiliary motors include a 1½-hp lubricating pump motor, a 1¼-hp flood-coolant motor, and three 1/37-hp feed-drive blower motors.

Performance tests show a resolution accuracy, defined as the maximum deviation between feedback selsyn signal and tape signal with feeds stabilized at zero velocity, of + or – 0.001 in. Transient errors on cuts parallel to a machine axis, with tolerances measured normal to that axis are + or – 0.003 in. tolerance at 50 ipm. This measure includes overshoot when entering or leaving a straight cut, assuming that adequate slowdowns have been programmed on the tape.

Tape Control

The three-motion magnetic-tape contouring system controls vertical, horizontal, and longitudinal movements, plus return to the "start" position. A one-inch-wide, 14-channel magnetic tape provides the data-input medium. The tape also signals auxiliary functions such as clamping for each motion, coolant valving, and selection of low- or high-speed gear range for each motion.

An important advantage in this machine is the presence of handwheels for manual control during setup, for quick jobs in which no tape is at hand, or to maintain some production if the control goes out of order. However, a powered "jog" control is supplied on the console for positioning during setup—the handwheel is primarily an emergency device.

Machine Operation

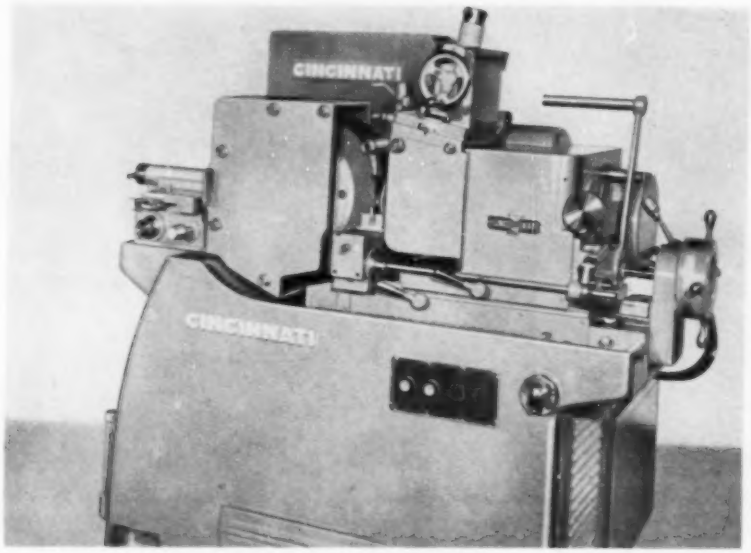
In operation, the piece is set up on the machine table so that all of the points to be worked fall within the capacity or range of movement; then the work is clamped. Micro-dials on the machine feeds are used to locate the spindle at a zero reference point on the work—or on the table. Then, with the proper tool in the spindle, the "Start" button is pressed, the tape control is engaged, and the part is completely machined, unless a tool change is necessary, without further manual effort by the operator. When the cut is complete, the table moves to position the cutter over the zero position—ready for the next piece.

To prevent error, a safety check is provided in the circuitry. If, during setup, the operator should accidentally misread the micro-dials, an error of more than 0.050 in. will prevent the machine from starting when the "start" button is pressed. Also, it is only necessary to position the cutter center within 0.050 in. of the zero position. It will "home" on the target center automatically.

For full control of all functions, 68 operator controls are conveniently placed on the console. This number includes meters and indicating lights plus 49 pushbuttons and selector switches. Many of these controls, however, are only necessary to provide reports of conditions or for special situations. It is said that the use of this equipment is not unduly complicated; that an operator can be trained to operate the machine (not program tape) in about two weeks.

Morey Machinery Company, Inc, 383 Lafayette Street, New York 3, NY

Materials and Parts



Centerless Grinding Machine Grinds Parts up to 1½ in. in Diameter

The Filmatic No. 1 centerless grinder is a small, general-purpose grinder suitable for grinding a wide range of metallic or non-metallic parts up to 1½ in. in diameter. Machine is recommended for rapid production of small drills, pins, punches, shafts and instrument parts.

Principal features include the company's Filmatic bearings for the grinding wheel spindle. These bearings automatically adjust for load and eliminate spindle flutter. Grinding wheel spindle is supported in a fixed mounting in the bed casting. A double slide and swivel plate construction between the regulating wheel housing and bed simplifies setups. The regulating wheel and work rest can be positioned individually or together in relation to the grinding wheel, and, through the swivel plate, can be adjusted to compensate for slight errors of alignment in setup or truing.

The machine accepts grinding wheels of 12-16 in. dia, and up to 4 in. wide. Regulating wheels are 7-9 in. dia, and up to 4 in. wide. Regulating wheel speeds are infinitely adjustable in the range from 22 to 300 rpm. A ½-hp motor supplies the power; a built-in tachometer indicates spindle speed.

A hydraulically actuated unit, mounted on the bed behind the wheel guard, trues the grinding wheel. Unit has a micrometer diamond adjusting dial, truing rate selector knob, and direction control lever. Straight screw type diamond truing is supplied for the regulating wheel. Profile truing equipment may be obtained in place of standard straight truing, if desired, for both grinding and regulating wheels.

Grinding wheel spindle bearings are automatically lubricated and are protected by an electrical cut-out switch. Electrical controls are contained in a specially designed cabinet. With the exception of the regulating wheel drive motor, all wiring conforms to JIC electrical standards.

Machine handles infeed and thrufeed operations equally well, and can be equipped for unusual setups or continuously automatic operation. Attachments and accessories include infeed and thrufeed work rests and blades; two types of automatic infeed attachments; crush truing; profile truing; grinding wheel positioning and many others. Bulletin G-703 available on request.

Cincinnati Grinders Inc, Cincinnati 9, Ohio

including...

MACHINE TOOLS AND ATTACHMENTS

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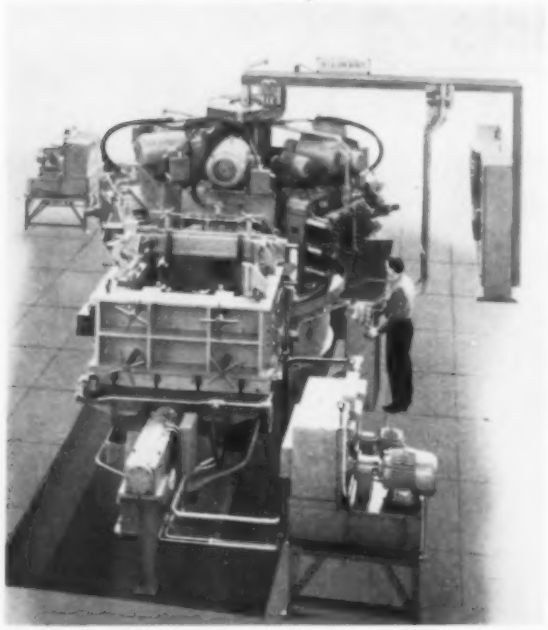
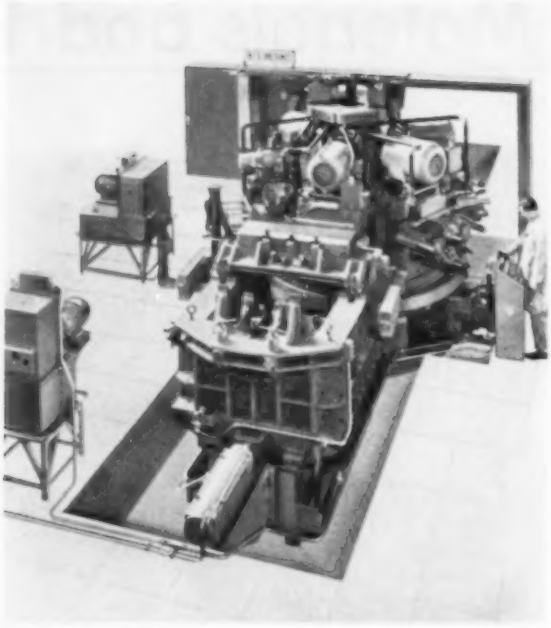
Pallet Truck 154
Straddle Stacker Truck 156

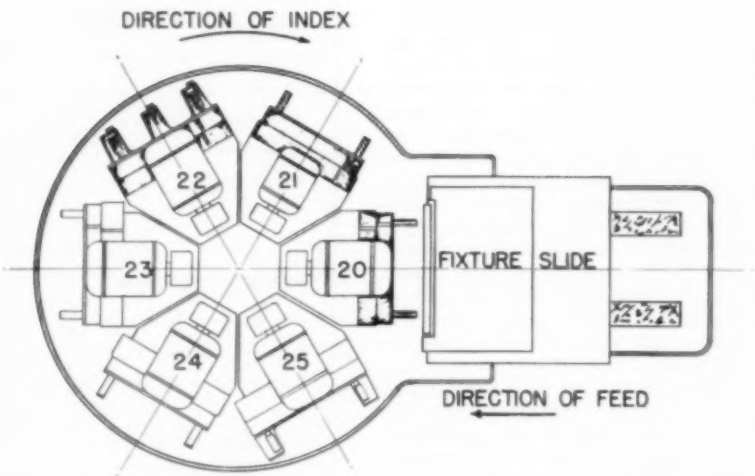


NO. 693-G handles three different welded steel cases (6.55 per hr) and three different cover parts (9.05 per hr). Loading takes three min; unloading, two min



NO. 695-G processes three different welded steel cases (4.73 per hr) and two different gear covers (5.00 per hr). Loading takes three min; unloading, two min

Special Turret-Type Machines Speed Job-Lot Production Of Heavy Steel Parts, Reduce Equipment Costs

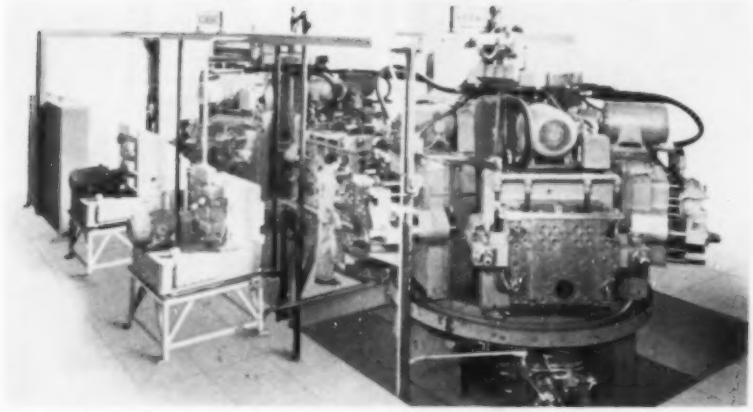


MACHINE NO. 693-G has six multi-spindle heads. Head 20 has 28 drilling spindles; head 21 has 28 spindles for chamfering, reaming and chamfering, reaming, and combined reaming, c'boring, and chamfering; head 22 has 24 tapping spindles and three milling quills; head 23 has 35 drilling spindles; head 24 has 35 spindles for chamfering and c'boring, chamfering, and reaming; head 25 has 31 tapping spindles and three milling quills. Machine base is arranged so that coolant and chips will flow into the chip conveyor and carry to the side of the machine. Approximate weight of the rotary table equipped with heads, motors, spindles and bushing plates is 40 tons. All four of the machines utilize rotary tables and shuttle-type fixtures

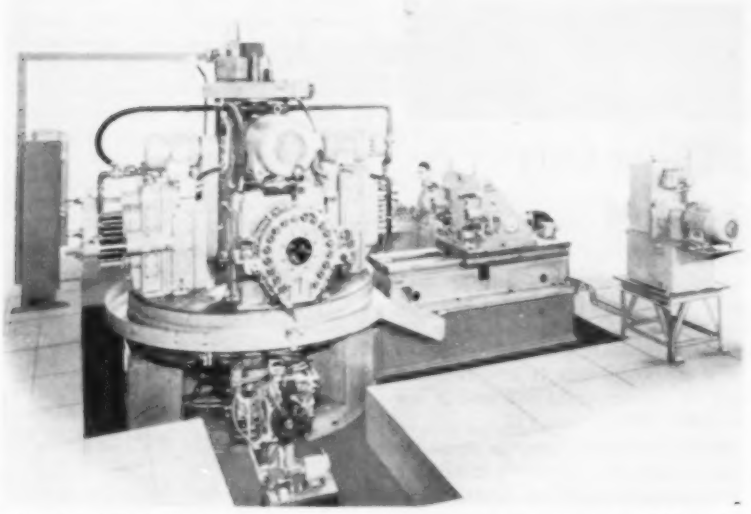
These special turret-type machines are designed for processing heavy steel components for road building equipment. Of special interest are the design features which insure greater economy in job-lot operations. Several of the machines are designed to handle more than one part—an important point in small-lot work. Over-all design and operating advantages of the four machines described here (two additional machines will be discussed in a forthcoming issue) effect up to 50% reduction in equipment costs and up to 80% reduction in floor space, not to mention the important savings in both machining and work-handling time brought about by combining many operations in one machine.

Machining Sequence

Machine No. 693-G receives three different welded steel cases and matching covers on which the bottom surfaces and the face being machined have already been milled. This machine drills, reams, chamfers and taps these parts. After leaving the



NO. 694-G drills, reams, chamfers and taps three different welded steel cases at rate of 2.90 per hr. Loading takes three min; unloading, two min



NO. 696-G drills, bores, chamfers and taps two different gear covers at rate of 5.90 per hr. Loading and unloading take 54 sec each

first machine, the cases go through an intermediate operation where both ends are milled, and then pass on to the second machine.

In the second machine, No. 694-G, different surfaces of the same case parts are drilled, reamed, chamfered and tapped. The third machine, No. 695-G, accepts the same case parts and two different gear covers after faces have been milled, dowel pin holes reamed and four locating spots milled. In this machine, the parts are drilled, bored, chamfered and tapped. The gear cover flange surfaces are milled and two dowel pin holes are reamed in another machine before the parts pass to the fourth machine. The fourth machine, No. 696-G, drills, bores, chamfers and taps the two different gear covers started on previous machine.

Machine Features

• No. 693-G has a 6-station, 96-in.-dia rotary table and a shuttle-type workholding fixture. It can hold workpieces up to a maximum of 2270 lb. Indexing time is five seconds. Complete change of setup takes 4 hrs. The fixture saddle, mounted on 40-in. ways, is hydraulically actuated and has three feed rates. Designed to drill, ream, chamfer and tap, the machine is equipped with three replaceable workholding fixtures—one for both the right and left-hand cases, one for the larger-sized case, and one for handling the cover parts. Workpieces are loaded into the fixtures manually with a hoist and are manually clamped. Only two hydraulic units are required—one for the rotary table, and one for operating the shuttle-type fixture.

• No. 694-G is equipped with two 96-in.-dia, 5-station rotary tables, one at each end, and a shuttle-type workholding fixture. It handles the same welded cases as the first machine. Parts are drilled, reamed, chamfered and tapped. The fixture saddle has two feed rates in two directions, and is supplied with locating blocks and clamps to hold the workholding pallets used for each of the parts being machined. Three hydraulic units are required—one for each of the tables, and one for the shuttle fixture.

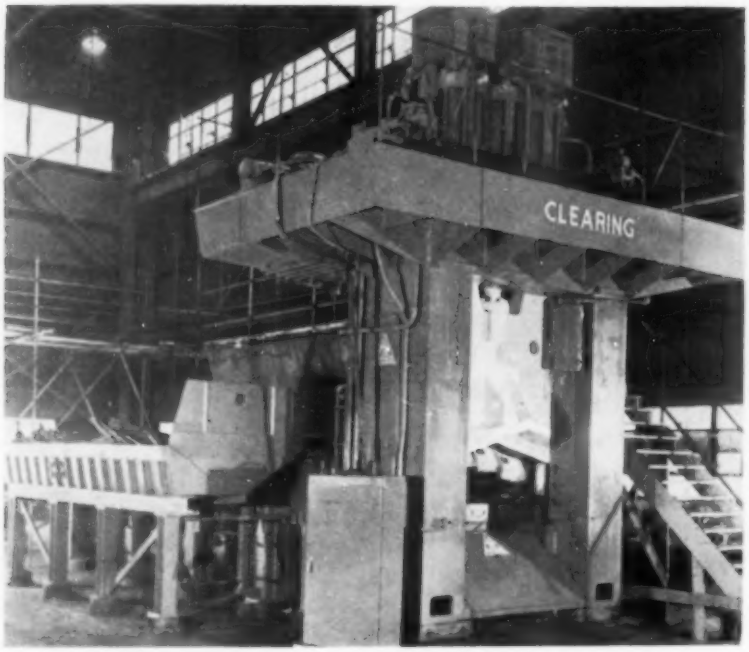
• No. 695-G drills, bores, chamfers and taps the same three cases and two different gear covers. This machine has a 6-station, 96-in.-dia rotary table and two shuttle-type workholding fixtures, one at each end. One fixture saddle holds the special pallets that carried the cases on the previous machine. The opposite saddle has a fixture designed to hold the gear cover parts. Case workpieces are transferred from one machine to another in their pallets; no reclamping is required. Only three hydraulic units are needed.

• No. 696-G handles only the two gear covers, the same parts started on Machine No. 695-G. This fourth machine has a 4-station, 96-in.-dia rotary table and a shuttle-type workholding fixture. Fixture parts are drilled, bored, chamfered and tapped. The fixture saddle is mounted on 24-in.-wide ways and has a manually-operated, two-position front-end stop. Several dogs are supplied to start the feed at correct distance. Cycle is arranged to traverse forward and hold during tapping cycle. Saddle moves forward and feeds to a positive stop for a generating-type spindle. Then the unit returns, and a positive stop can be adjusted to a second position to allow a second cut with a feed-out tool. Two hydraulic units are required.

Controls

All electrical controls are built to JIC standards and the machines are equipped with Barnes exclusive Electro-Graphic detector panel which reduces the down-time caused by electrical malfunctions. All hydraulic units are Barnes built, are mounted on stands, and conform to JIC standards.

W F and John Barnes Co, Rockford, Ill



Clearing 600-ton Scrap Shear Cuts Up to 30 Tons of Scrap per hr

Machine, weighing approx 335,000 lbs, is reported to be the only 600-ton self-contained completely automatic hydraulic shear available. Only electrical connections are necessary to begin operation after setup.

Unit will cut practically any kind of dissimilar scrap into equal lengths, adjustable in 6-in. increments from 6 to 48 in., at rate of up to 30 tons per hr. First model is being built for Heller Compressed Steel Co of Peoria; ten others are currently under construction. Manufacturer claims that one of these units will do the work of five or six alligator shears now used by the scrap industry.

From front, machine is similar in appearance to one of Clearing's large hydraulic presses. At rear, however, is a 22-ft-long hydraulically tilted hopper and feedbox which houses the hydraulic ram that feeds scrap to the adjustable, heavy-duty alloy shear blades. Material is loaded into hopper by magnetic crane; when full, hopper is hydraulically elevated by pushbutton and contents dumped into feedbox; lid closes, and hopper returns to original position. Hydraulic ram in feedbox moves forward a preset distance equal to length of cut, pushing scrap under blades. A 100-ton hold-down device locks down, holding scrap firmly in place. Shear slide moves down, cutting through scrap charge and repeats this action until all material has been processed. Meanwhile, hopper is refilled, ready for next charge. Magnetic crane picks up cut scrap and loads it into railroad cars, or conveyorized equipment can be installed for removal.

Multiple speed stroke provides fully automatic speed change for fastest possible cycling. Quick close is at speed of 510 ipm until a pressure of 70 tons is encountered, then intermediate pressing at 255 ipm until 180 tons pressure is required. In pressing to full tonnage, from 180 to 600 tons, slide operates at 85 ipm. Automatic reversal and quick return to top of stroke is at 510 ipm after contact with a limit switch. Other controls include electrical pushbutton inching—up or down; manual inch-down handwheel on valve control provides fine inching for setting shear blades; emergency stop button; and switch for selecting inch, auto, or off.

Shearing capacity is 5⅜-in. dia round, or 1¼-in. thick plate, mild steel; diameter of piston rams (three) is 16 in.; height above floor (over-all), 24 ft; stroke of shear slide, 32 in.

Distributed by Consolidated Mill Supply Co, 5843 S Loomis Blvd, Chicago 36, Ill

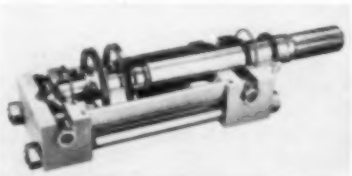
Forty-Ton, Double-Crank Press Features Extra Large Die Area

Model 4 B 40-ton, double-crank, OBI Rousselle punchpress features extra large die area and an electrically controlled, air operated friction clutch. The ram is guided not only by the ways but by the crankshaft itself, assuring accurate operation even under unbalanced loads.

The bed area is 16 x 48 in.; face of ram, 14 x 36 in. Die space is 12 in.; spacing between housings, 36 in. Press is adaptable for multiple punching and large workpieces.

Electrical control features plug-in controls for foot- or two-hand operation. A selector switch permits instant changeover from single to continuous operation. Jog button is provided as an aid for setting dies.

Service Machine Co, 2310 W 78 St, Chicago, Ill



New Line of Cylinders Meets Automation Standards

Line of air and hydraulic cylinders for heavy-duty service has been developed to meet automotive industry automation standards. Hydro-Line Series S2 are rated at 1000 psi hydraulic, 200 psi air, and for non-shock load up to 1500 psi hydraulic. All meet JIC specifications.

Nine bore sizes from 1½ to 8 in. are available in a choice of 11 standard mountings.

Hydro-Line Manufacturing Co, 5600 Pike Rd, Rockford, Ill

V-R CARBIDE INSERTS

...A Style and Grade for Every Operation

Standard V-R Grade	Characteristics and Applications
EE	Strength and toughness characterize this grade. It is the strongest of all steel cutting grades. Recommended for rough and interrupted cutting.
EM	A general purpose steel cutting grade with good wear-resistant property.
VR-75	A tough heat-resistant general purpose steel cutting grade. Especially recommended for severe applications where high heat is generated.
E	A hard grade with good abrasion resistance. Recommended for medium and light machining and boring of carbon and alloy steels.
EH	The hardest and most abrasion-resistant steel cutting grade. Recommended for high speed, light finishing cuts and precision boring.
2A5	A grade for general purpose machining of cast iron, non-ferrous metals and non-metallics. It has good strength and superior abrasion-resistance in excellent balance.
2A7	The hardest and most wear-resistant grade for cast iron, non-ferrous metals and non-metallics. Recommended for light, fast finishing cuts and for machining to close tolerances such as required for precision boring.

Standard and Special Throw-away Type and Long Inserts for All Mechanical Toolholders

Standards. Vascoloy-Ramet manufactures and stocks a complete line of standard cemented carbide inserts for straight and lead angle turning, facing, chamfering, profiling, grooving, face milling, planing, shaping, and other operations commonly performed with mechanical toolholders.

Specials. V-R produces custom-made inserts to meet special requirements.

Let your V-R qualified field service engineer show you the economies of tooling with V-R carbide inserts. Call him today, or write.

Ask for literature.

Cemented Carbides Toolholders Face Mill Cutters

MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS C-642

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

862 Market Street • Waukegan, Illinois

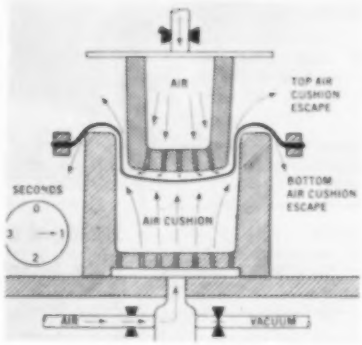
Automatic Contour Miller Provides 100% Increase in Speed or Accuracy

The Onsrud A90-36A automatic contour milling machine built for Convair provides electro-hydraulic drive for the critical feed components of multiple-feed milling heads so that production speed and accuracy can be maintained throughout a milling operation. These new drive systems are reported to result in an overall increase in speed or accuracy of over 100%. The systems were developed by Onsrud in cooperation with General Electric Co.

Machine is 15½ ft wide x 105 ft long. Two gantry carriages hold six milling heads, with total of 560 hp. The No. 6 horizontal head is a good example of how the new drive systems operate. This head has four different feed components or four distinct motions—longitudinal, transverse, twist (angular) and vertical. These are controlled through remote Selsyn tracer systems and are operative either singly or in any combination. For this particular head, the vertical feed is critical and here electro-hydraulic drive is applied. As a result, the vertical feed component is capable of instantaneous response and high acceleration to provide an equivalence in motion for maintaining proper relationship with the other feed components.

The A90-36A provides a resolution accuracy to a tolerance of 0.0005 in. and a part-to-part reproducible accuracy to a tolerance of 0.0015 in. This latter tolerance is held at a feed of 60 ipm on a radius of one-half inch.

Onsrud Machine Works, Inc, Machine Tool Div, 7712 Lehigh Ave, Niles 31, Ill



New Technique Improves Deep-Draw Vacuum Forming of Plastics

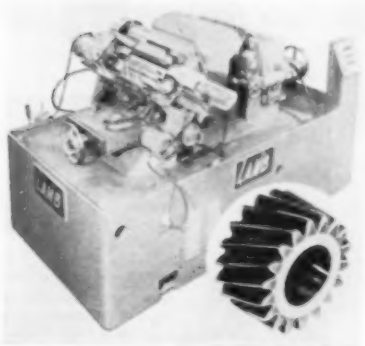
A new technique, called Air Cushion Control, makes it possible to deep-draw form heavy-gage polyethylene of all types, with high uniformity of wall thickness and relatively low corner radii. The method is equally successful for thin or heavy-gage Kralastic, heavy sections of high-impact styrene, vinyl, and other thermoplastics.

The plastic sheet is placed in the clamp frame in position over cavity mold and is heated to molding temperature. Clamp frame is draped to an elevation slightly below top of mold. Air is then introduced into mold and pressure build-up causes plastic to stretch into bubble. A split-second later a heated assisting plug descends into the plastic bubble. Air jets from base of plug prevent freezing of the plastic immediately below the plug. The plastic is now stretched toward the general shape of the final product, while it is literally suspended between two moving cushions of air.

As soon as plug has made its maximum descent, all air pressure is cut off and simultaneously a vacuum is drawn in the mold. The hot plastic immediately snaps to the shape of the mold, losing its heat rapidly to the cold mold. The part is removed by utilizing the same system for introduction of air pressure into the mold, coupled with the lifting of the drape frame.

Plug attachment is designed for easy incorporation into existing Auto-Vac machines.

Auto-Vac Co, 1984 State St Extension, Bridgeport, Conn



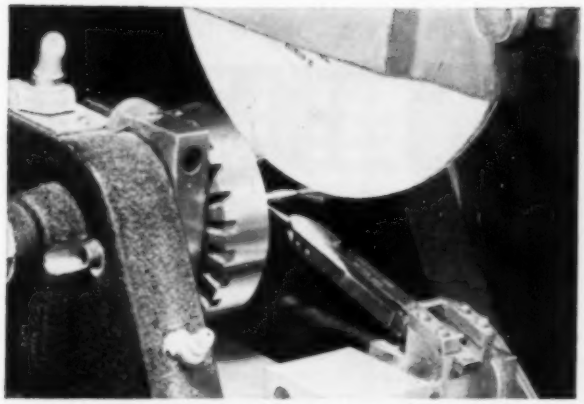
Machine Deburrs and Chamfers Hardened Gear Teeth

Designed for production rates of 900 to 2100 gears per hr, this gear tooth chamfer grinder incorporates a unique method of parts handling and feeding. The gears are fed through the intake chute where a cam-controlled air cylinder moves them onto the first of two continuous feed belts that provide part motion. A rack aligned with the crush-formed grinding wheel assures an accurate mesh between gear teeth and abrasive wheel.

At the end of the first pass, gears move through a re-positioning device to the lower feed belt where the operation is duplicated on the opposite ends of the teeth.

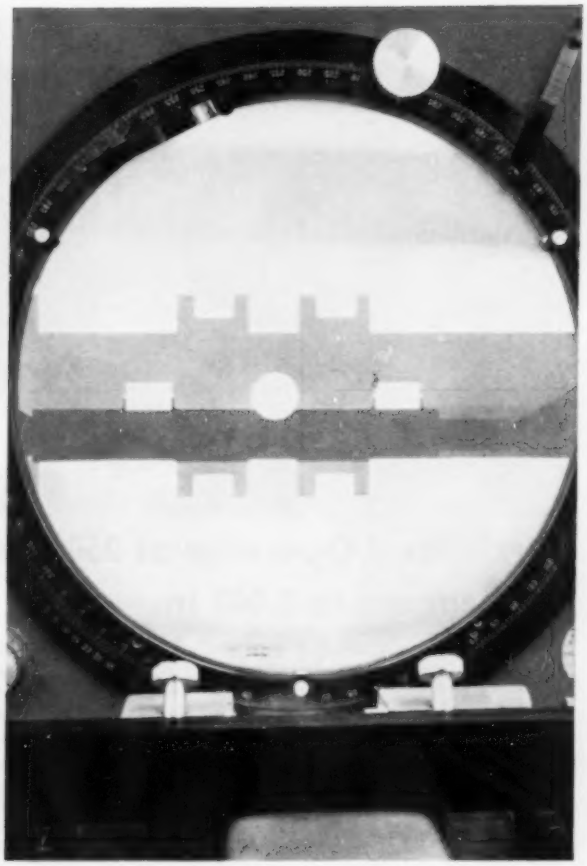
Machine operation is continuous and completely automatic. Work loading and ejection features are designed to be adaptable to automated parts handling systems, or loading can be done manually. Changes in gear size or tooth configuration can be accommodated by minor fixture revisions and by changing the crush roll form dresser to meet new requirements.

F Jos Lamb Co, 5663 E Nine Mile Rd, Detroit 34, Mich



1. Piston lands on hydraulic control valves are trimmed on a surface grinder fitted with motorized centers.

2. After trimming, piston and sleeve are mounted on worktable of Kodak Contour Projector for simultaneous projection by two light sources to gage amount of stock removal.



3. Overlap of piston and sleeve images is indicated by black area; overlap can be measured quickly by traverse of one part and observation of dial indicator.

How to do a 7½-hour gaging job in half an hour

How would you solve a gaging problem like this one?

In developing hydraulic control valves, engineers at a major firm producing aircraft components worked out a neat method of trimming piston lands in relation to ports in their mating sleeves.

But meeting the required .0002″ overlap between piston lands and sleeve ports meant using several different gages to determine the amount of stock which had to be trimmed. Result: *7½ hours to trim each valve.*

To solve the problem, quality control engineers now use a Kodak Contour Projector with two light sources and two filters, one red and one green. This system projects a superimposed image of the piston on the sleeve. Where an overlap occurs, the red and green images combine into a black image. The width of this black overlap gives the amount of trim required. Result: *just ½ hour needed—7 hours saved on each valve!*

Maybe you've come up against a gaging problem that's eating up time and money in large quantities. To learn how you can solve it by optical gaging, send for the booklet "Kodak Contour Projectors." Write to:

Apparatus and Optical Division
EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

Hitch-Feed Operates at 2500 fpm, Is Accurate to 0.002 in.

Press feed arrangement, designated the Flexofeed, hitch feeds coil stock at 2200 to 2500 fpm, with accuracy to ±0.002 in. Feed strokes up to 36 in. are possible.

Flexofeed is extremely adaptable and flexible in application. It is used in conjunction with a standard high-speed Flexopress which uses conventional dies. Changeover from one part run to another can be accomplished quickly because dies are readily accessible. Conventional tool design for forming and drawing at high speeds can be used without modification. The mechanism is actuated by mechanical linkage driven directly from the press.

Twelve-inch-wide, grain-oriented lamination stock has been run at rates of 2500 fpm. Based on 15-in. feed stroke, this equipment operates smoothly at 165 to 170 spm; parts are pierced, blanked and cut off. Hitch-feed fingers average speeds of 5000 ipm. Accuracy is consistently held to ±0.002 in.

Precision Welder & Flexopress Corp, 5520 Ibsen, Cincinnati, Ohio

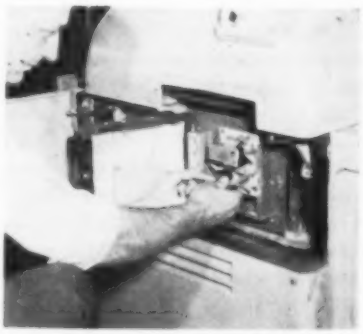
Lowcost Process Coats Hot Steel With Layer of Aluminum

New process applies a coating of aluminum to steel while both metals are heated to temperatures ranging from 1300 to 1650 F. By this method, steel can simply and economically be made to withstand many years of exposure to weather or coastal atmospheres without need for periodic protection. The aluminum also protects the steel from corrosion caused by heat.

Process is accomplished in the Upton electric salt bath furnace. Pure aluminum is melted and floated upon a barium chloride base in the bath or pot of the furnace, and a flux is floated on top of the aluminum. The steel is then dipped in and out of this bath and immediately transferred into another furnace containing only molten salt at the same temperature. Here, the coated steel is dipped in and out to smooth out the aluminum and remove the flux.

Depth of aluminum ranges from 0.003 to 0.010 in., depending on requirements. Depth is controlled by varying the furnace temperature.

Upton Electric Furnace Co, Inc, 150 Grand Ave, Mt Clemens, Mich



Potter & Johnston Adds Tape Control to Turret Lathe Line

New tape control system can soon be ordered as special equipment on all new P&J 3U, 4U, 6DRE40, 8U and 10U automatic turret lathes or can readily be added at small cost to these models now in use.

The tape is prepared in the standard way. It is then inserted into the machine's tape reader and the machine is set for automatic operation. Starting, stopping, rapid traverse, and speed and feed changes of the spindle, turret and cross-slides are all controlled automatically by the tape. Duplicate controls provide for manual operations when this is required.

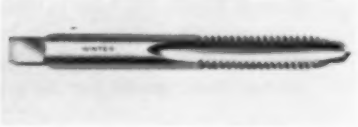
Potter & Johnston Co, Pawtucket, RI

Dreis & Krump Press Brake Has 25-Ton Capacity

This 25-ton Chicago press brake will bend 60 in. of 14-gage or 72 in. of 16-gage mild steel. All-welded steel frame, and deep-section bed and ram of rolled steel plate assure permanent alignment and minimum deflection under load.

Variable speed drive provides speeds from 20 to 50 spm. A 3-in. variation in the die space is effected by a manual adjustment of the bed. All bearings and gib surfaces are oiled by a one-shot lubricating system. Bulletin 265-58 is available on request.

Dreis & Krump Mfg Co, 7400 S Loomis Blvd, Chicago 36, Ill



MULTI TAP for tapping blind holes in materials such as soft aluminum, stainless, magnesium, and some types of copper is specially treated to increase surface hardness to aid in retarding abrasion encountered in these materials. Stock items are available in No. 6 through 12 in machine screw sizes; ¼ through ¾ in. in fractional—*Winter Brothers Co, Rochester, Mich*

GUARANTEED PURITY!

Argon of 99.995% minimum purity Guaranteed by LINDE!

The inert argon welding gas you get from LINDE is now *guaranteed** to contain *less than 50 parts per million* of impurities. And it's LINDE's regular industrial argon—not a special, extra-cost grade. You get this extremely high purity *on delivery* to you, regardless of the way the argon is delivered.

LINDE's 50 years of experience in producing gases of extremely high purity make this assurance possible. You can depend on LINDE *consistently* for the highest possible purity in the gases you use. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

*LINDE argon delivered as a liquid is the purest inert gas on earth. Guaranteed to contain less than 50 parts per million of impurities, LINDE liquid argon contains, on the average, less than ½ of this amount and practically no moisture.

For Argon of guaranteed highest purity . . . call LINDE!

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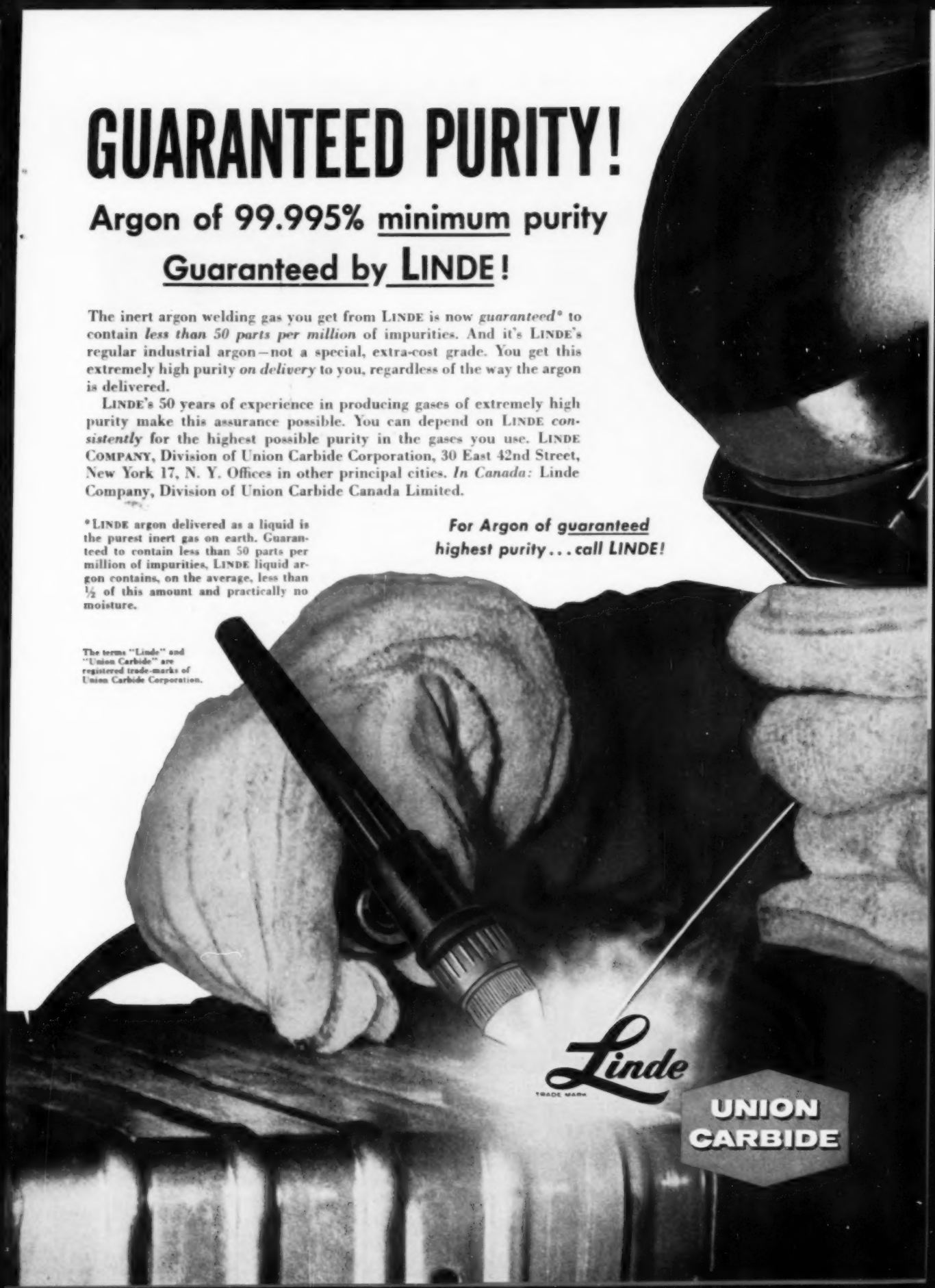
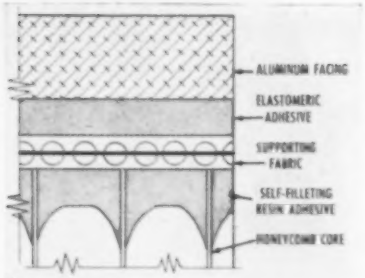




3M Dry Adhesive Films Provide Stronger Honeycomb Bonding

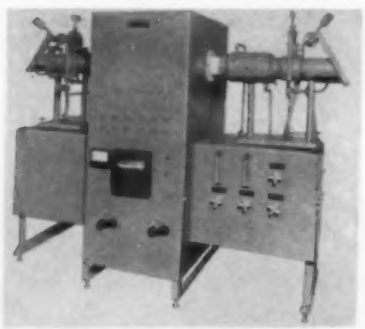
This new series of heat curing, supported, composite film adhesives for honeycomb sandwich construction provides the highest combination of peel and beam shear strength. They also reduce production costs.

The films consist of a high strength elastomeric adhesive film on one surface and a self-filleting adhesive on the other surface. The elastomeric adhesive bonds to the facing and the self-filleting adhesive bonds to the core of the honeycomb sandwich panel. Service temperatures range from –70 F to +250 F.

New films eliminate need for sandwich core priming. This increases production, reduces fabrication costs, reduces weight of finished panels, and reduces equipment costs.

Two of the adhesives in the series, designated Scotch-Weld AF-200 and AF-201, are now available. AF-200 has produced aluminum honeycomb panels with a beam shear, flexure strength of 1580, 1530 and 1385 psi at temperatures of – 67, +80 and +180 F. Peel strengths were 18, 24 and 21 in.-lbs per in. respectively.

Minnesota Mining and Mfg Co, Adhesives, Coatings & Sealers Div, 423 Piquette Ave, Detroit 2, Mich



Furnace Provides Protective Atmosphere for Heat Treating

Type GT-34 high temperature atmosphere furnace is supplied with a metal-ceramic tube assembly, complete with blast gates and automatic flame curtains at both ends. The large, 4-in.-ID tube handles a wide variety of heat treating applications requiring protective atmosphere at temperatures up to 2750 F.

A water-jacketed cooling chamber enables the cooling of work while under protective atmosphere. Furnace is a self-contained unit with all electrical components in the bottom. Unit is pre-wired and piped. Bulletin T-1090.

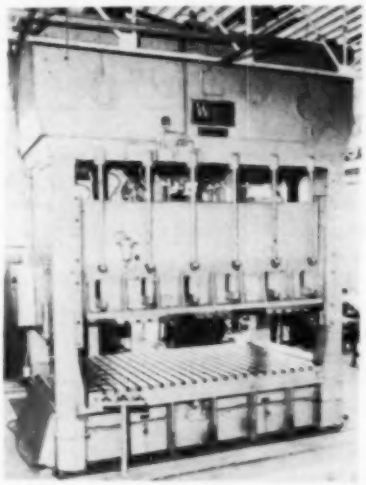
Lindberg Engineering Co, Pilot Plant Equipment Div, 2321 W Hubbard St, Chicago 12, Ill

Process Permits Use of Molybdenum at Temperatures Over 2000 F

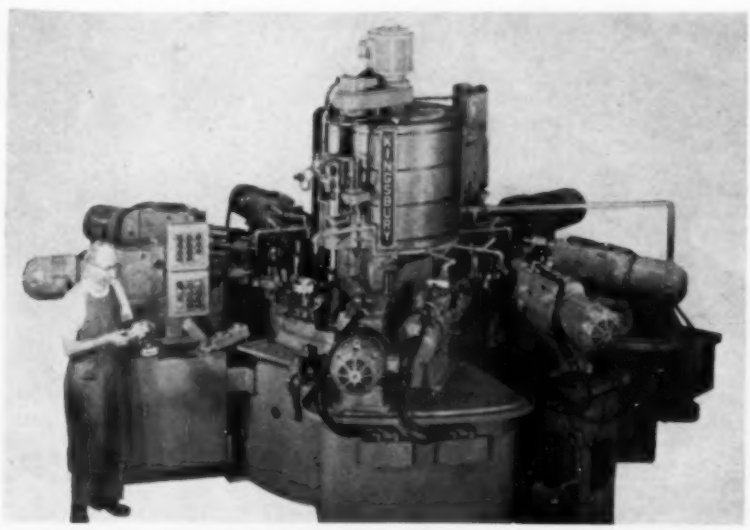
Chromalloy W-2 process permits molybdenum to be utilized at working temperatures in excess of 2000 F. This process, like the company's standard Chromalloy process (*AM* —Jan 13 '58, p158), involves a diffusion of chromium into the surface, providing molybdenum with a high degree of oxidation resistance. This is necessary because at high temperatures the metal forms a volatile oxide which leads to rapid erosion and eventual deterioration — thus making it difficult for the fabricator to take full advantage of molybdenum's outstanding high-temperature strength.

The process is easily controlled and reproduced. A similar application of the Chromalloy W-2 protective alloy surface to niobium (columbium) has been achieved.

Chromalloy Corp, 4350 Tarrytown Rd, White Plains, NY



MECHANICAL PRESS, specially designed for an aircraft manufacturer, is used for production runs of deep drawn parts. It is a double-back-geared, four-point eccentric gear press, and has a capacity ½ in. from bottom of stroke of 300 tons. Slide has an area of 90 x 136 in., with a stroke of 18 in. Operating speed is 14 spm—*Federal Machine and Welder Co, Warren, Ohio*



DIE CASTINGS FOR AUTOMATIC TRANSMISSIONS are drilled, end reamed, countersunk and finish reamed at a rate of 270 parts per hr on this automatic machine consisting of ten units with a total of 19 spindles. A 60-in. index table holds ten work fixtures, with power clamping and automatic unclamping. Bushings guide all tools—*Kingsbury Machine Tool Corp, Keene, NH*

An improved
Combination Starter
for extra safety

While the changes in the new Allen-Bradley Bulletin 712 and Bulletin 713 starters may be relatively minor, they were made in your interest—to give you the best control on the market.

The new operating lever has been attractively restyled and structurally improved. Now the disconnect switch can be locked "open" or locked "closed"—with three padlocks of any kind. For the maintenance engineer, a concealed latch pin is built into the lever, which permits opening the door of the cabinet without opening the disconnect switch and stopping the motor. The door can also be padlocked shut independently of the operating lever.

With the disconnect lever in the "off" position, the cabinet door can be opened. At a glance, it can be seen that the movable contacts are open. An added "safety" feature—the incoming line connections are covered with an insulating plate to prevent accidental contact.

ALLEN-BRADLEY
QUALITY

MOTOR CONTROL

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

BULLETIN 712—These modern A-B combination starters cost no more than a separate starter and disconnect switch, and make a neater, safer, more attractive installation.

Size 1—to 7½ hp, 220 v; 10 hp, 440-550 v.

Size 2—to 15 hp, 220 v; 25 hp, 440-550 v.

Size 3—to 30 hp, 220 v; 50 hp, 440-550 v.

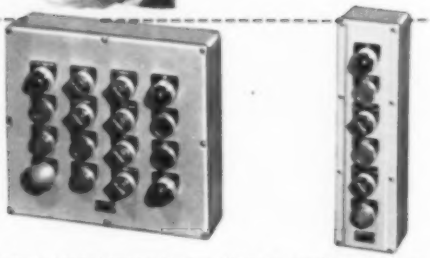
Size 4—to 50 hp, 220 v; 100 hp, 440-550 v.

3-58-MR

Not only the Motor Starters, but the Accessories must be "Quality," too!

we specify ALLEN-BRADLEY ...all the way

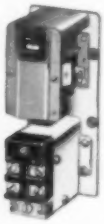
"Trouble" that shows up in a motor starter is often traced to a faulty operating auxiliary—such as a limit switch or even a push button station. Allen-Bradley builds the same high quality into its many accessories as it does into its motor starters—to give you millions of trouble free operations. They are also tested as thoroughly. Contacts are usually double break and always are of a silver alloy, which means they remain in perfect operating condition. It will pay you, too, to specify Allen-Bradley *Quality* control—"all the way!"



Bulletin 800T Oiltight Control Stations. Available in from one to sixteen units, in die cast aluminum enclosures.

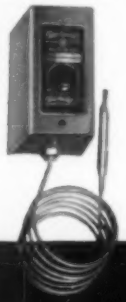
Bulletin 802 Precision Limit Switch, with oil-tight head and body.

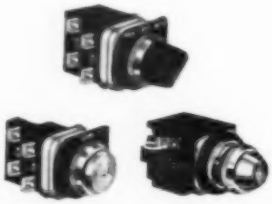
Bulletin 805 Foot Switch. In rugged die cast enclosure for the toughest service.



Bulletin 849 Pneumatic Timer. Reliable and accurate.

Bulletin 837 Temperature Control with snap action, precision switch.





Bulletin 800T Oiltight Push Button, Selector Switch, and Press-to-Test Pilot Light.

Bulletin 800 Standard Duty Push Button. One, two, and three buttons; also as selector switch.

Bulletin 836 Pressure Control in NEMA 4 watertight enclosure.

3-58-MR

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

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MACHINES AND ATTACHMENTS

1 MACHINE TOOLS — *Brown & Sharpe Mfg Co, Providence, RI.* 36-page illustrated catalog MT2 covers company's entire line of milling, grinding and screw machines and variety of optional mechanisms and additional equipment available.

2 SUPERFINISHERS — *Gisholt Machine Co, 1245 E Washington Ave, Madison 10, Wis.* 44-page catalog (Form 1169-B) presents illustrated descriptions of 15 Masterline models and three attachments. Included are explanation of finishing process, sections on automatic size control, engineering service available, floor plans for all models. 24 different job applications pictured and explained.

3 UNIVERSAL GRINDER — *Landis Tool Co, Waynesboro, Penna.* 24-page catalog 1-57 contains illustrated data on 10-in. Type H. Applications and features described. Complete specifications plus standard and extra equipment included.

4 CENTERLESS GRINDING MACHINE — *Cincinnati Grinders Inc, Cincinnati 9, Ohio.* 20-page bulletin G-703 describes Filmatic No. 1, a small, general purpose unit for grinding wide range of metallic or non-metallic parts up to 1⅛ in. in dia. Features illustrated, specifications detailed, standard and optional accessories covered.

5 MACHINE TOOLS—*Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis.* 12-page condensed catalog describes and pictures line including air, arbor, foot, and drillpresses; bandsaws, squaring shears, milling machines, power presses.

6 MILLING MACHINES—*Sundstrand Machine Tool Co, 2531 Eleventh St, Rockford, Ill.* 20-page catalog covers five Model C Rigidmils with detailed tabular data attachments described. Other available on specifications and dimensions. Optional types pictured and discussed include universal bed, all-angle head, adjustable column vertical, rail type.

7 GEAR GENERATORS — *Farrel-Birmingham Co, Ansonia, Conn.* 32-page bulletin 460 gives data on Farrel-Sykes units for generating gears of all types which operate on parallel axes; specifications, information on sizes and capacities, illustrations of machines in both T and C series.

8 MILLING SPINDLES — *Romulus Tool & Engineering Co, 12531 Huron River Drive, Romulus, Mich.* 12-page catalog RT-58 illustrates and describes full line (in standard models to 50 hp, special models above that rating), hydraulically driven, that features constant horsepower over variable-speed range. Construction, specifications, operating characteristics, application photos and details.

TOOLS AND ACCESSORIES

9 KENDEX TOOLING—*Kennametal Inc, Latrobe, Penna.* 20-page catalog B-305 covers 42 styles and 220 different holders for these tools with throw-away carbide inserts. Includes negative and positive rake tools, roller turner tools, boring bars, heavy-duty tools, multiple insert turning and grooving tools, boring heads, and special facing tools. Code-numbering system simplifies ordering.

10 DRILLPRESS AND MACHINE VISES—*Wilton Tool Mfg Co, 9525 Irving Park Rd, Schiller Park, Ill.* Illustrated catalog 691 describes a new drillpress vise as well as latest design improvements in the MilOmatic air-hydraulic vise, used as automatic production fixture. Heavy-duty machine vises also covered.

11 V-R FACE MILL CUTTERS—*Vascoloy-Ramet Corp, Waukegan, Ill.* 4-page illustrated bulletin 5501 gives details on cutters, for throw-away carbide inserts, available in both negative and neutral rake designs and RH and LH styles, to fit both C arbors and spindle nose.

12 PYROMETER SUPPLIES—*Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Windrim Aves, Philadelphia 44, Penna.* 64-page catalog G100-8 describes complete line of thermo-

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couple accessories for measuring temperature. Includes new Meg-O-Pak assemblies and new insulated extension wire.

● DIAMOND WHEELS—*Clipper Diamond Tool Co, 845 Hudson St, New York 14, NY.* 32-page catalog-manual covers grinding wheel types, with sectional drawings, dimensions, diamond concentrations, general characteristics of different bonds, recommendations, selection data. Graphic index included. Request direct on company letterhead.

● ABRASIVE CUTOFF WHEELS—*Wallace Supplies Mfg Co, 1300 Diversey Parkway, Chicago 14, Ill.* 36-page illustrated booklet discusses factors involved in selection of the right wheel for a specific job. Request direct on company letterhead.

13 GAGING AND MEASURING PITCH DIAMETER—*Johnson Gage Co, 834 Cottage Grove Rd, Bloomfield, Conn.* Bulletin 400 discusses in detail "Does the Three-Wire System Measure True Pitch Diameter?" Bulletin 401 covers "The Effectiveness of Various Contacting Elements Used for Gaging and Measuring Pitch Diameter."

HEAT TREATING AND WELDING

● INDUSTRIAL GAS EQUIPMENT—*Charles A. Hones, Inc, 3468 Grand Ave, Baldwin, LI, NY.* 36-page catalog 1570 illustrates and describes line of Bunsen gas burners, furnaces, and accessories for heat treating, metal melting, soldering and drying. Includes sections on special furnaces and manual and automatic controls; dimensional and BTU performance tables; temp curve and work rate charts. Request direct on company letterhead.

14 FLAME CUTTING MACHINE—*Air Reduction Sales Co, Div of Air Reduction Co, 150 E 42nd St, New York 17, NY.* 16-page illustrated catalog 804B covers features of new No. 44 Oxygraph, a multiple-torch model. Sections discuss gas distribution system, various accessories including electronic tracer, heavy-duty magnetic tracer, and manual and spindle tracers.

15 WELDING MACHINE MAINTENANCE—*A O Smith Corp, Welding Div, Milwaukee 1, Wis.* 15 x 23-in. chart gives data on protective maintenance for all ac and dc welding machines. Includes trouble-shooting tables with cause and remedy columns, plus recommended cable and fuse sizes.

PLANT SERVICE EQUIPMENT

16 BLAST CLEANING — *Wheelabrator Corp, 1140 S Byrkit St, Mishawaka, Ind.* 28-page catalog 143-D is a handbook of blast cleaning, finishing, and shot peening ideas. Section covers variety of applications of Wheelabrator airless abrasive blast equipment, including 50 case histories. Features and specifications of different machines included.

17 FINISHING EQUIPMENT—*Schmieg Industries, Inc, PO Box 4701, Detroit, Mich.* 8-page illustrated catalog 600 describes line for both large producer and smaller concern. Cleaning, painting, baking units outlined and discussed.

18 TRIPLEX PUMPS—*Kobe, Inc, 3040 E Slauson Ave, Huntington Park, Calif.* 12-page illustrated bulletin 1157 covers units for high pressures up to 30,000 psi, high temps (in excess of 500 F), continuous duty. Applications include operation of hydraulic test equipment, molding presses, lubricating systems.

19 VENTILATING UNITS—*General Blower Co, Morton Grove, Ill.* 24-page bulletin UVS-104 covers complete line of belt-driven ventilating units with either forward curve wheels or backward blade non-overloading wheels. Includes performance tables, engineering data, selection and installation information, specifications on the 12 basic size packages.

20 INDUSTRIAL CRANES — *Ederer Engineering Co, 2931 First Ave, S, Seattle 4, Wash.* 30-page second edition of catalog CR-610 includes new material on hoist gears and cases, and crane controls. Components illustrated and described; engineering data in tabular form.

PARTS AND MATERIALS

21 GENERAL PURPOSE CONTROL DEVICES — *General Electric Co, Schenectady 5, NY.* 88-page catalog GEC-1266C contains detailed selection charts covering starters through 200 hp. Includes descriptions of motor starters, contactors, relays, solenoids, limit switches, pushbuttons, and pilot devices, with prices, features, wiring diagrams, dimensions, and application information for each.

22 ULTRA-STRENGTH STEELS — *Climax Molybdenum Co, 500 Fifth Ave, New York 36, NY.* 16-page booklet discusses and provides technical data on group characteristic property of which is ability to retain ductility and toughness at tensile strengths over 300,000 psi. All grades commercially available in the US currently are tabulated with minimum recommended tensile strengths.

23 MINIATURE BALL BEARINGS—*Miniature Precision Bearings, Inc, Precision Park, Keene, NH.* 24-page bulletin gives details on line of MPB's ranging in size from ⅛ of an inch OD down to 1/10 OD. Numbering system provided for classifying bearings by material, size, type, mounting, torque, and lubrication.

24 MAGNESIUM ALLOYS—*White Metal Rolling & Stamping Corp, 33 Moultrie St, Brooklyn 22, NY.* 64-page booklet describes properties, uses, applications, and advantages. Applications, specifications, properties. Data included on Whitelight aluminum alloys and products.

25 SPECIAL ANTI-FRICTION BEARINGS—*Industrial Tectonics, Inc, 1835 Jackson Rd, Ann Arbor, Mich.* 24-page illustrated bulletin AFB-2 gives information on design requirements for anti-friction bearings of unusual shapes and sizes, and current data on suitable bearing component materials for high temperatures, corrosion-resistance, non-magnetic properties, and other specialized operating conditions.

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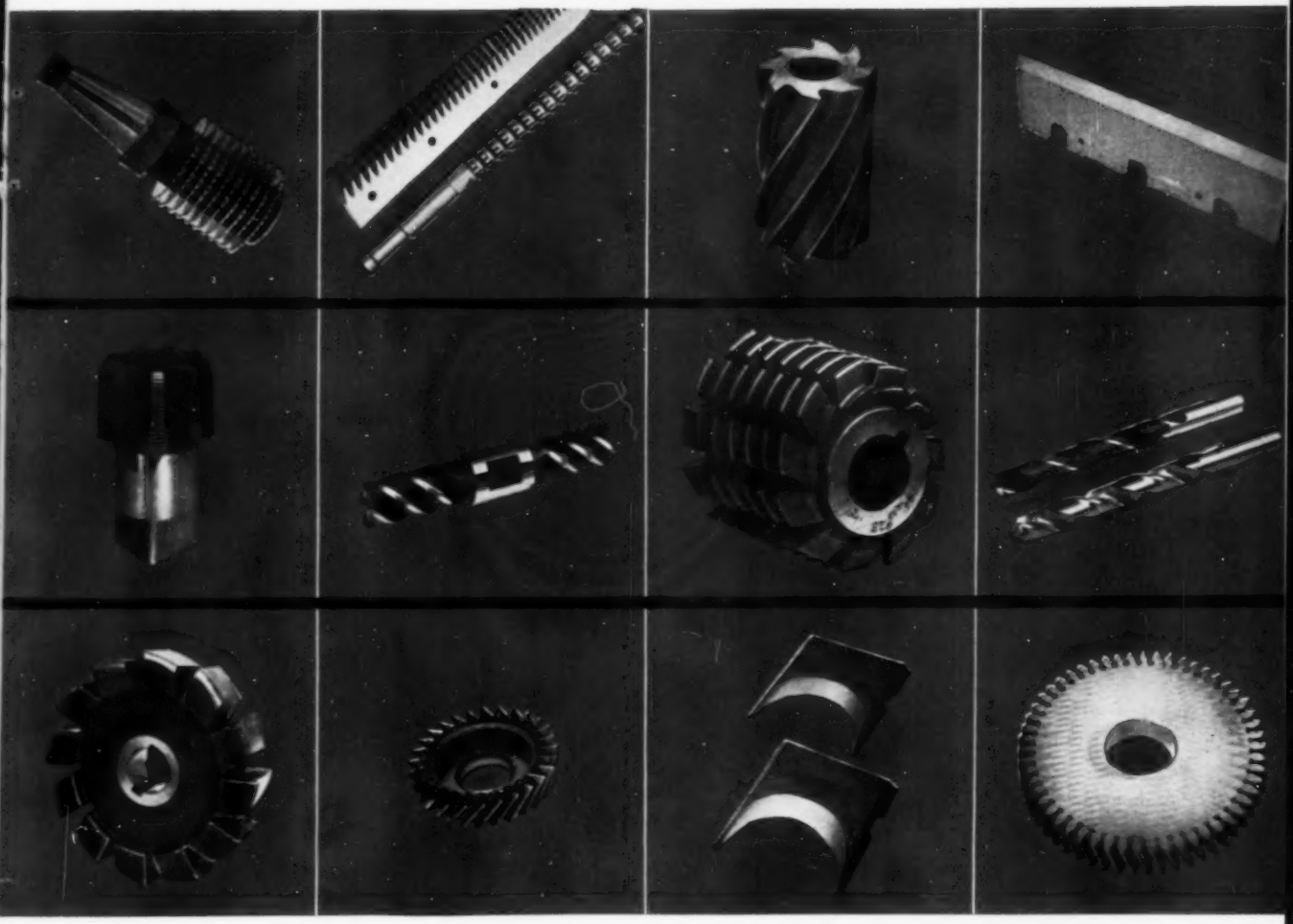

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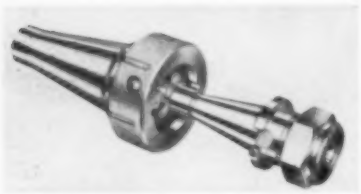


Quick-Change Holders Can Be Used With Standard MMS Tapered Tools

All present standard MMS tapered tools can be used with new line of holders. A simple grinding operation makes present adapters suitable for use with the units.

Seven models, each in several size ranges, include Morse taper holders for boring mills and radial drills, milling machine holders that fit standard spindle tapers, turret lathe holders, straight shank holders with No. 30 or 40 MMS socket, and a variety of adapters.

Erickson Tool Co, 34350 Solon Rd, Solon, Ohio

Automatic Machine Is Designed For Vertically Opposed Operation

Deburring, chamfering, spotfacing, drilling, and/or tapping, reaming, and other related machining operations can be done individually, simultaneously, or in sequence on this automatic unit. It can be used with a small index table, manual or air-clamp fixtures, hopper or vibration feed. It is particularly adaptable for deburring or chamfering both sides of holes in thin sections.

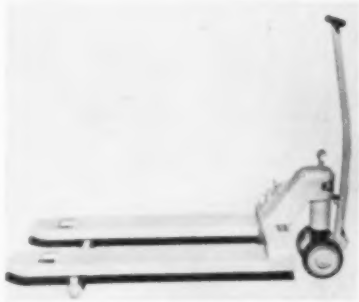
Machine is furnished with two Dumore Series 24 automatic drill units with drilling capacity of ⅜ in., tapping capacity of ½—13 in mild steel at 10 speeds from 400 to 7420 rpm by interchanging pulley combinations. Controlled feed range is up to 60 ipm; rapid approach rate is 600 and return rate 300 ipm. Max spindle stroke of each unit is 3 in.; largest opening possible between chucks at rest position is 22 in. Both units and table are adjustable vertically on a solid steel column through a gear and pinion to a common rack. Normal spindle alignment from tool to tool is guaranteed within 0.003 although dead center alignment is possible by adjustments. Additional details in bulletin 1-58.

R E Ellis Engineering Co, 5001 W Fullerton Ave, Chicago 39, Ill

Drilling and Tapping Heads Fit 15- and 20-in. Delta Drillpresses

Two new sizes of 4-position drilling and tapping heads, known as Quadrills have been added to company's line. Heads have an expanded quill sleeve designed to fit the larger size quills on 15- and 20-in. Delta drillpresses. Quadrills drill, ream, countersink and counterbore on one setup. Literature available.

Chicago Quadrill Co, 1846 Busse Highway, Des Plaines, Ill

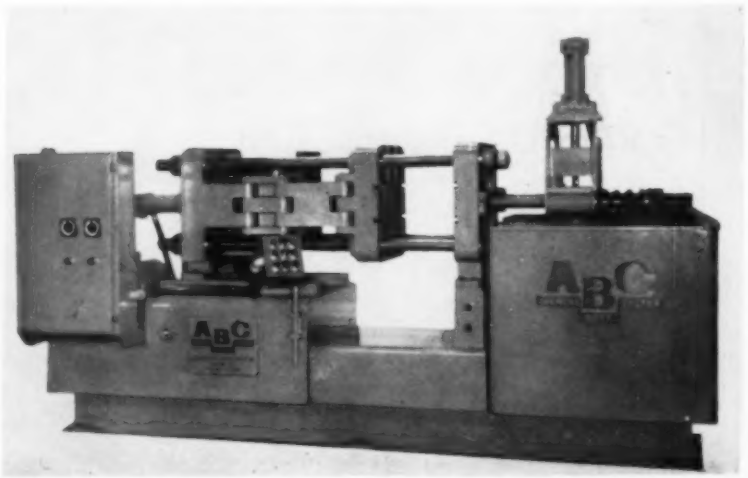


3000-lb Capacity Pallet Truck For Narrow Aisle Operations

Hydraulic hand pallet truck added to Raymond's line of narrow aisle equipment has same external design as the company's 2000-lb unit but incorporates stronger lifting mechanism, chains, and reach rods, plus reinforced frame.

Carrying frame sizes range from 18 to 30 in. wide and 30 to 60 in. long. Model has a 270° steering arc for maneuverability in close quarters. Bulletin 226 (supplement 1) available.

Raymond Corp, 47-161 Madison St, Greene, NY



DIE CASTING MACHINE, Model 5000, is a hydraulically operated, heavy-duty machine with a shot capacity of 7 lb of zinc. Features include 150-ton, 2½-in. tiebars, 24 x 24-in. steel platens, an extra-large-capacity melting furnace, and manifold-mounted valves. It has a high cycling speed and is convertible, with addition of a cold chamber, for operation with aluminum—*ABC Die Casting Machine Co, 400 E 142 St, Dolton, Ill*

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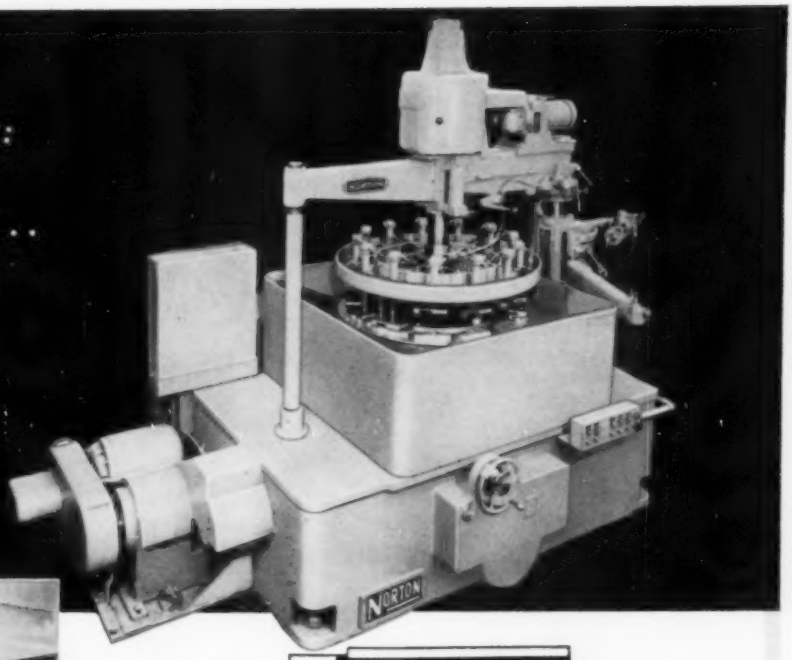
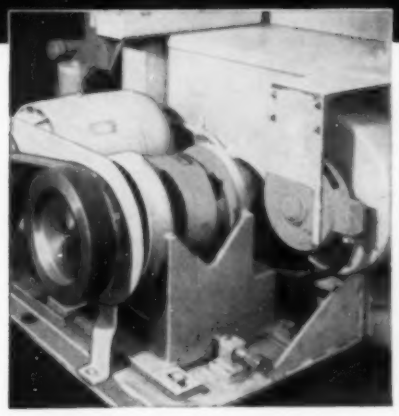
no-shock starts,
automatic
torque control





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magnetic particle clutch and

MAGNEBRAKE®

An important component of Norton Company's No. 48-F Hyprolap lapping machine shown above is the Vickers Magneclutch. This outstanding clutch provides the smooth, no-shock starts and the reliable automatic torque control needed for precise metal finishing. The Vickers Magnebrake used on the Hyprolap machine insures smooth, reliable braking. Magnebrakes can also provide shockless, controlled deceleration.

If critical torque transmission is needed in your equipment, you'll find many advantages in the Vickers Magneclutch . . . a magnetic particle clutch that provides smooth operation with no grab or chatter, fast response and long life (there's no wear on torque transmitting surfaces). Write today for Bulletin 6000-A.

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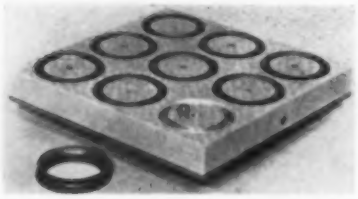


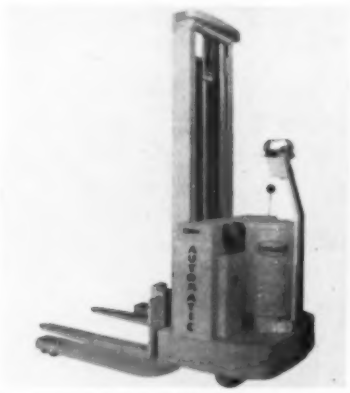
Universal Vacuum Chuck Handles Work in Varied Sizes, Shapes

Octopus has closely set suction grips that hold non-magnetic materials firmly in place for drillpress, router, Bullard lathes and other milling operations.

Any one or any combination of vacuum apertures can be sealed off, confining gripping area to work at hand. Any piece of material which covers one of the small rubber sealing rings can be worked on, yet multiplicity of suction grips provides stability during machining for even the largest size materials.

Chucks are made from 921-T cast aluminum tooling plate on special order in specified sizes. Magnetic chuck can be converted for working non-magnetic materials by superimposing the Octopus fitted with a steel base plate.

Pioneer Aluminum Inc, 5851 W Imperial Highway, Los Angeles 45, Calif



Transporter Straddle Stacker Introduced in Shorter Model

Electric-powered, pallet-type straddle stacker, Model WAT, has been added to Transporter line. Truck length has been reduced through use of shorter powerhead, making the unit more adaptable for narrow aisles.

Lift is up to 130 in. with standard uprights of 83 in. Model is available with either Mono or Duo masts; latter gives max free lift of 62 in. Capacities are 4000 lb with telescopic uprights, 6000 lb with non-telescopic. Class H silicone motor is standard on the heavier capacity units, optional on others.

Automatic Transportation Co, 149 W 87th St, Chicago 20, Ill

LOW - CAPACITY COMPRESSION TESTER, Model CT-134, is operated by turning knob at bottom of tester. Load measuring system incorporates bourdon-type gage, cylinder and piston, and a trapped oil reservoir. Unit has a capacity of 300 lb, occupies space of 11 x 6 in., and stands 26 in. high. Vertical opening is adjustable from 4 to 5½ in.—*Steel City Testing Machines, Inc, 8817 Lyndon Ave, Detroit 38, Mich*

Optical Device Permits Accurate Initial Tool Positioning

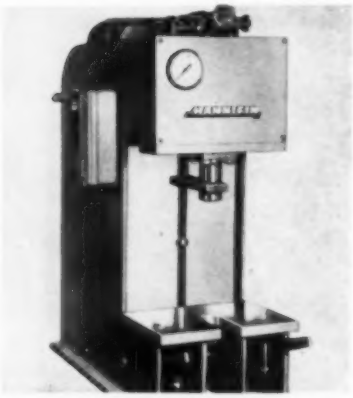
Optical coincidence reading system, designated Unisec, makes it possible to read shaft positions to one second of arc directly. Device is expected to have many uses in industry—especially in the initial positioning operation in tooling, where costly error can be forestalled.

The Unisec is basically an angle-reading device. It consists of an optical coincidence reading system plus a precision glass circle. The device reads the 6-in. circle to one second of arc directly; it reads both sides of the circle at once, to remove eccentric error.

It can be attached to any stationary shaft. Turning the sighting device from base point to an object indicates the angle between. Readings from the optically flat glass circle are viewed through a microscope eyepiece which swivels 350° to a low reading from any stance. Images of graduations taken from the opposite sides of the circle are made to coincide in the reading microscope (by means of a deviating prism system).

Special eyepieces and units for screened projection are available. Systems with larger circles and housings are also available. Illustrated bulletin describes operation and principles of device.

W & L E Gurley, Troy, NY



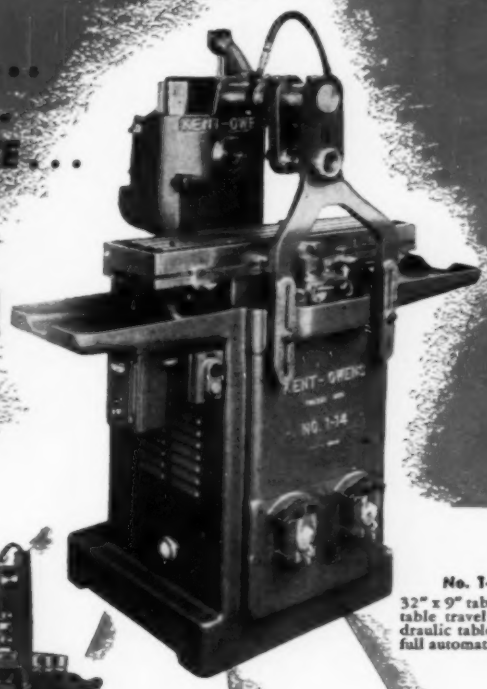
4-ton Benchpress Designed For Hydraulic Trimming

High-speed unit has been introduced for forming, trimming, and force-fit assembly operations. Dual hand control and adjustable down-stroke control are standard; electric push-button controls with or without pressure reversal are available as optional features. Return stroke, adjustable in all models, permits shortening the work cycle to where the ram just clears the workpiece on repetitive operations. Tonnage is also adjustable from 10% of capacity to full, rated capacity.

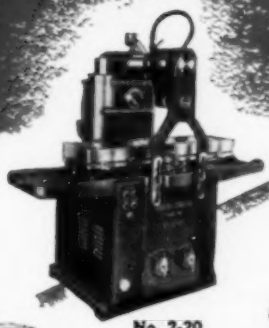
Stroke is 6 in.; reach from throat of frame to centerline of ram is 6 in.; gap is 12 in. The 4-ton model has following speeds: down, advance, 700 ipm; down, feed, 330 ipm; return, 670 ipm. (Faster 2-ton model is also available). Press stands 39 in. above bench or other surface on which it is used, on a 17 x 30-in.

EXTRA RUGGED... SPEEDY... ACCURATE...

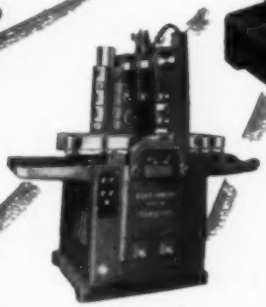
to Bring Down Milling Costs!



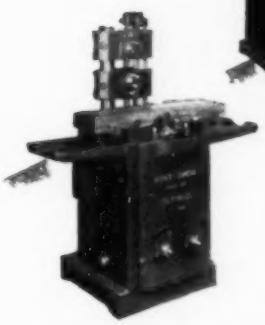
No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.



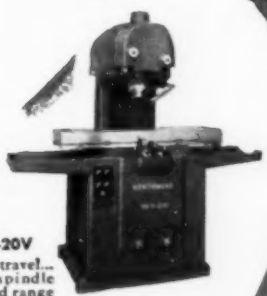
No. 2-20
20" table travel... 42" x 12" table... fully automatic hydraulic table feed.



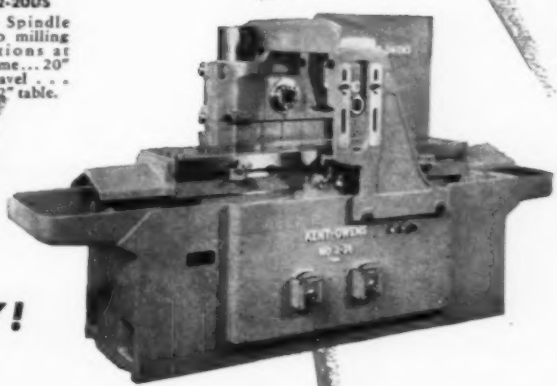
No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.



No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.



No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 3-36 ... 36" table travel ... 64" x 16" table ... full automatic hydraulic feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout these rugged machines make the difference . . . greater dependability . . . accuracy maintained in meeting tough production schedules. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #754 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, O.

KENT-OWENS
for milling machines

KENT-OWENS REPRESENTATIVES

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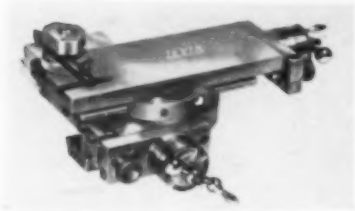
baseplate. Matching steel base can be furnished if press is to be floor mounted. Removable table is 14½ in. wide x 10 in. deep; top is 8¼ in. above the mounting surface.

Hannifin Co, Machinery Div, Des Plaines, Ill

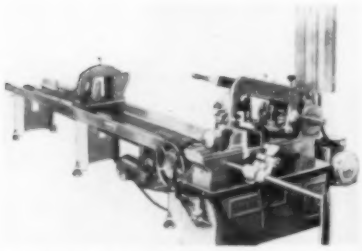


Heavy-Duty Slide Rest Fits Standard Instrument Lathes

Compound slide rest is designed for standard jeweler's instrument lathes. Leadscrew dials are 1-in. in dia; swivel slide is locked with two T-bolts and reportedly will hold securely under any strain. Both slides are fitted with micrometer stops.

Unit may be supplied with screw feeds for both slides or with lever feeds on either or both. Newly designed toolpost eliminates danger of breaking T-slots when clamping a tool.

Louis Levin & Son, Inc, 3610 S Broadway, Los Angeles 7, Calif

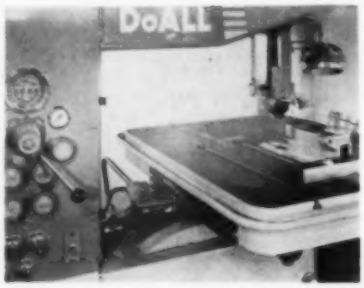


Automatic Cutoff Machines Have Stepped-Up Cycling Time

New Utility Automatic is designed for auxiliary service, short run work, handling overloads. It will cut cold rolled steels, cast iron, HSS, hard alloys, as well as titanium alloys.

Models 66W2A and 66W4A (2 or 4-speed) give 1-in. pushup per second. Accuracies to 0.005 in. is assured by a microswitch control. Speed changes are made easily. Fast-operating automatic air vise is incorporated. Lower initial costs and lower maintenance and operating costs are claimed. Bulletin S66WA gives additional details.

Racine Hydraulics & Machinery, Inc, 2000 Albert St, Racine, Wis



Band Machining Speeded By New Hydraulic Table Control

DoAll Model 26-3 production band machine can now be equipped with single cycle automatic table return to reduce operator manipulation of table controls.

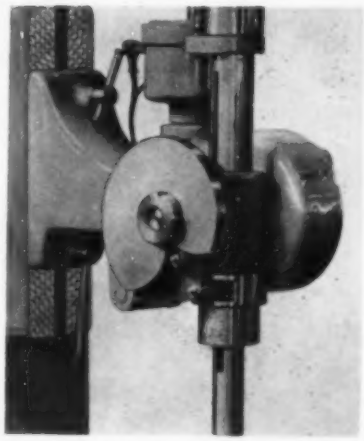
After sawing or slotting, job is set up on the table, adjustable trip dog on table periphery is set for desired length of cut. In operation, trip dog engages a limit switch when table reaches desired infeed point actuating a solenoid valve to return table to loading position. It remains in loading position until cycle start button is pressed by operator when another feed stroke begins. Feed rate and pressure are established by the normal table hydraulic controls. Once set, these controls need not be touched during a production run; operator is required only to unload and reload the work holding fixture and engage cycle start button.

DoAll Co, Des Plaines, Ill

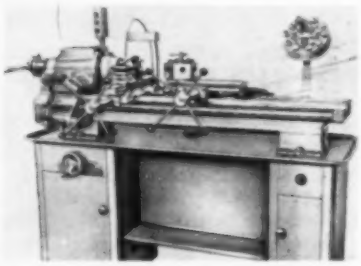
Air Reduction Introduces Manual Aircomatic Welding Equipment

This new manual unit for the application of the Aircomatic or inert-gas-shielded arc-welding process provides a completely new type of wire feeding system to handle the broadest range of wire types and sizes. Both "push" and "pull" guns are available to cover the complete range of wire types and sizes from 0.020 in. hard to ⅛ in. aluminum. Equipment is portable and can be taken wherever an operator can go.

Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42 St, New York 17, N Y

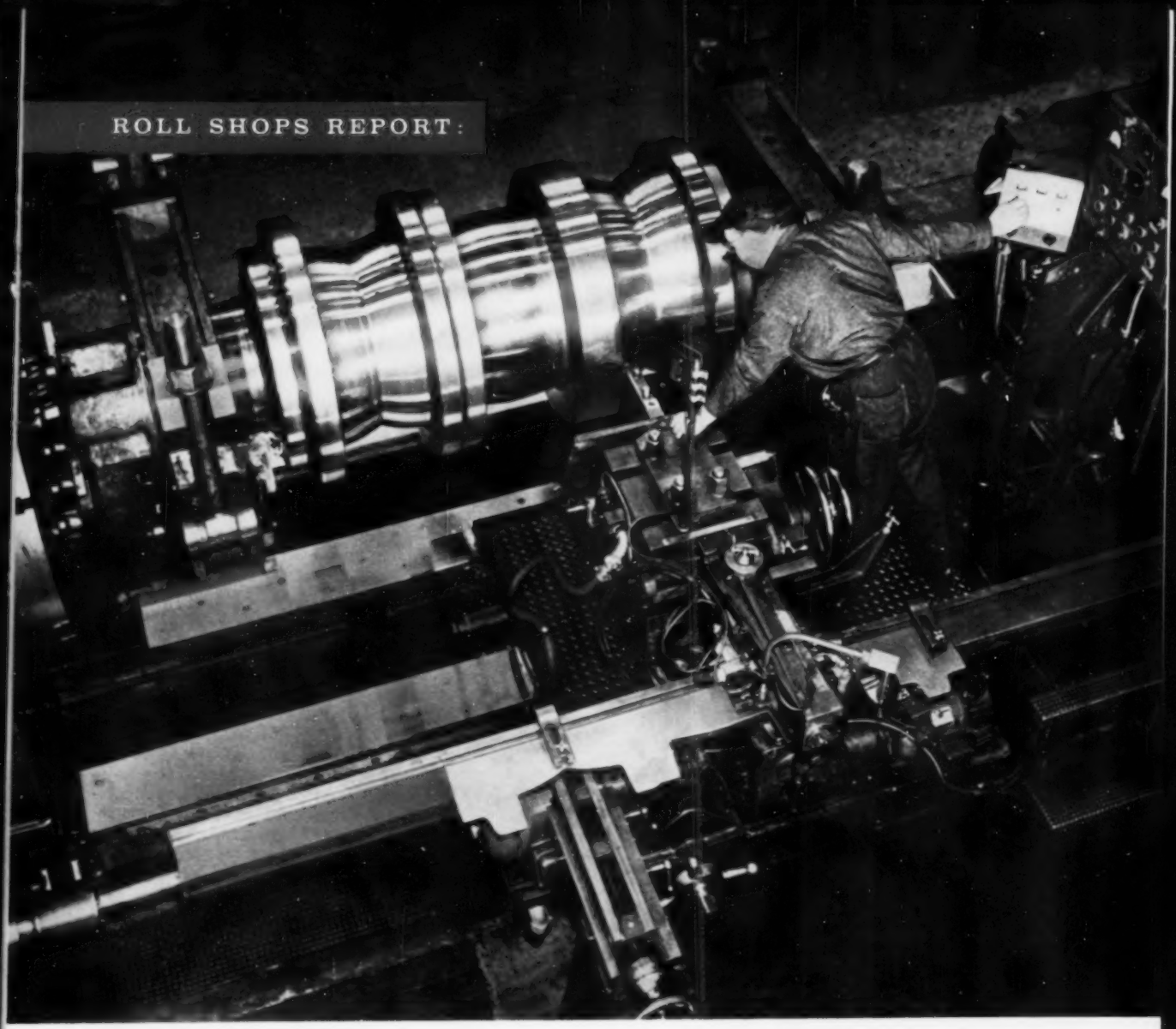


CAM FEED, for medium to large production drilling runs, controls the amount of travel up to 3 3/16 in. including rapid advance and feed. Feed cycle is started by pushbutton or foot switch; feed is engaged through an electric DC magnetic clutch; and the cycle is stopped automatically at end of operation by a limit switch. Bulletin AC—*Edlund Machinery Co, 128 Huntington St, Cortland, NY



New Accessories Broaden Range Of Rockwell-Delta Metal Lathes

Production - line applications of standard Delta 11-in. lathes have been expanded with introduction of a double toolpost cross-slide available for installation on units in the field. When used with a Delta bed turret it converts an 11-in. engine lathe into a six-station turret lathe, or hand screw machine. Pilot wheel feed provides unusually rapid slide



"The skill's built in...and it does the work of three!"

What are your most urgent roll problems? A growing work load...high roll turning costs . . . a shrinking supply of skilled roll turners? *If that's the case, you're no different from 90 per cent of steel mill roll shops.*

Mack-Hemp Automatic Contouring lathes solve these problems for you. They reduce turning time by taking off more metal in one hour than a roll turner can in three or four on a block lathe. Yet Mack-Hemp lathes accurately reproduce within 0.001-inch complicated roll patterns from ful-size templates by means of an electronic "pilot."

That's why many leading steel mill roll shops are using Mack-Hemp contouring lathes and why a number of others have ordered them.

To find out how these lathes can help you, drop us a line today.

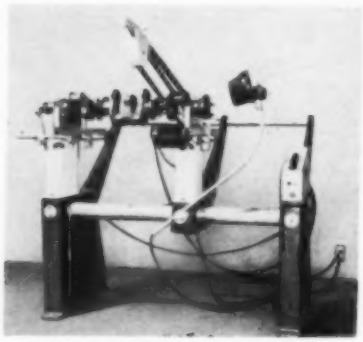
MACKINTOSH-HEMPHILL
Division of E. W. BLISS Company
Pittsburgh and Midland, Pa.

MACKINTOSH-HEMPHILL DIVISION · PITTSBURGH, U.S.A. · BLISS

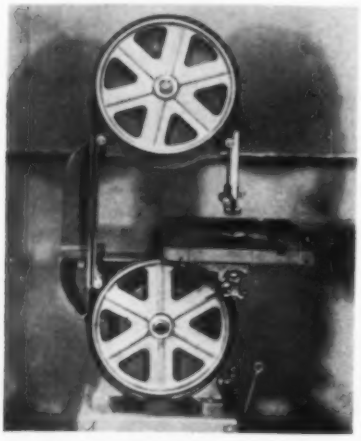
movement with a full 8-in. travel to increase range of jobs. It also provides extra clearance for die heads, box tools, and other accessories held in the bed turret.

Universal tool positioning is accomplished by T-slots in the toolpost pads and a slide which provides for transverse and longitudinal adjustment without disturbing the saddle on the bed.

Rockwell Manufacturing Co, Delta Power Tool Div, 481 N Lexington Ave, Pittsburgh 8, Penna



INDUSTRIAL BALANCER, Model 702, is capable of balancing to 0.004 oz-in. all rotating parts weighing between ¼ lb and 300 lb and measuring from ¼ to 30 in. in diameter. Setup takes less than two minutes and requires no special tools. Kinetic and dynamic unbalance are determined electronically, at the mechanical resonance of rotor and vibratory system —*Stewart-Warner Corp, Alemite Div, 1826 Diversey Pkwy, Chicago 14, Ill*



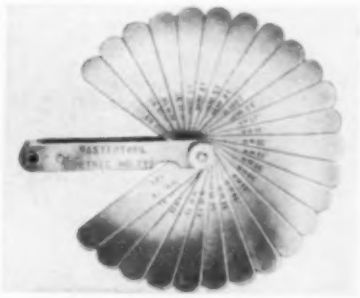
Metal-Wood Bandsaw Provides More Rigidity, Higher Torque

Improved model of this 14-in. wood- and metal-cutting bandsaw provides greater rigidity and increased torque transmission. A heavier drive system eliminates chatter and vibration under difficult operating conditions at the extremes of the speed range —40 to 3000 fpm with a standard 1725-rpm motor.

Saw can cut anything from wood, plastics and fibrous materials to armor plate, stainless steel and tool steel. A bull gear free-wheeling on a double-row ball bearing provides the overriding feature in the direct drive, which eliminates the necessity for changing V-belts throughout the entire 75-to-1 speed reduction range. Torque reduction and multiplication are achieved through step pulleys and gear box; the gear box alone provides 55-to-1 ratio.

All gear shafts are mounted on sealed ball bearings, and gears operate in an oil bath within a totally enclosed housing. Saw retails for $247 (slightly higher west of Rockies).

Rockwell Mfg Co, Delta Power Tool Div, 483 N Lexington Ave, Pittsburgh 8, Penna



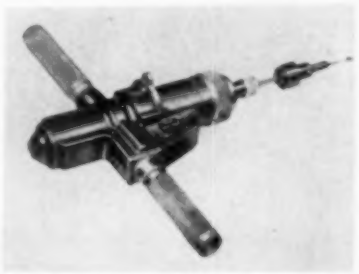
THICKNESS GAGE, Mastertool 722, is marked in thousandths of an inch and also in metric equivalents. Device contains 25 blades ranging in thickness from 0.0015 in. (0.04 mm) through 0.035 in. (.89 mm)—*Klopp Engineering Inc, 35551 Schoolcraft Rd, Livonia, Mich*

Straight-Handled Air Hammer Designed for Close-Quarter Work

Bantam Bully Model SP-2-900B has straight handle for one-hand operation in close-quarter or blind-spot work. It can be suspended from overhead reels for use on production lines.

Tool measures 7¼ in. long, weighs 20 oz, uses 6.5 cfm of air. Metering trigger permits control of blows from 0 to 13,000 per min. Slip chuck snaps in or out the 24 tools used for scaling, chiseling, peening, Speed or Pal nut assembly, paint and barnacle scaling. Tools can be locked in eight different positions. Price is $52.50.

Superior Pneumatic & Mfg, Inc, 4758 Warner Rd, Cleveland 25, Ohio



Tube Roller Controls Expansion by Accurate Measurement of Torque

Pneumatic instrument controls tube expansion, in manufacture of heat exchanger equipment, by accurate measurement of torque. It can roll up to 12 tubes per min. Accurate to within 0.001 in., the Airetrol automatically stops expansion according to a predetermined setting. The torque sensing mechanism is unaffected by fluctuations in air pressure.

Finger-tip micrometer adjustment ranges from 0.5 ft-lb to 37 ft-lb at 90 psi. Roll handle throttle provides rapid forward and reverse operation. Three models are available for tube sizes ranging from ¼ to 1½ in. OD. All three may be used for rolling both steel and nonferrous tubes. Carrying case holds tool, expanders, instructions, torque chart, and lubricator.

Airetool Mfg Co, Springfield, Ohio

Solid-Carbide Countersinks Cut Without Chatter or Tearing

Single-flute, solid-carbide countersinks, Series 1704, are available with included angles of 60°, 82° or 90°, and in three cutter diameters, ½, ¾ and 1 in. The tools are reported to sink holes without chatter or tearing, and are recommended for all materials except hardened steels.

Countersinking can be done at speeds as low as 150 to 500 rpm. Tools have ample chip clearance and are easily resharpened. A special feature allows these tools to be used down to ⅛-in.-dia holes.

Atrax Co, 240 Day St, Newington, Conn

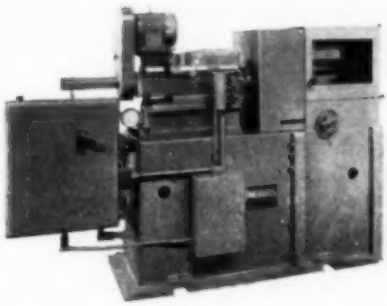
WHEN YOUR PRODUCTS DEMAND

PRECISION PRODUCTION

demand *Morris*

MACHINE TOOLS

GUN DRILLING MACHINES
equipped with AIR-OIL-MATIC Drill Units



Never before, have all these advantages for gun drilling been offered in one unit, creating a wide new range of applications in automatic high production.

ADJUSTABLE AUTOMATIC LOAD CONTROL
6 OR 9 INCH STROKE
INFINITELY VARIABLE SPEEDS AND FEEDS
COMPLETE COORDINATED HIGH PRESSURE COOLANT AND CHIP REMOVAL SYSTEM

Increases efficiency and ease of production for parts like these:

*Deep holes ⅛" diameter and up.

*Deep holes located off-center.

*Deep holes in out-of-balance parts.

*Deep holes in irregular shaped parts.

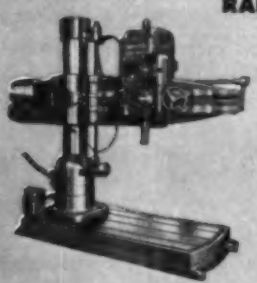
AIR-OIL MATIC DRILL UNITS

provide fast, low-cost production for drilling and allied operations.

- **Adjustable Feed**
- **Wide Range of Spindle Speeds**
- **Convenient Controls**
- **Hydraulically Controlled**

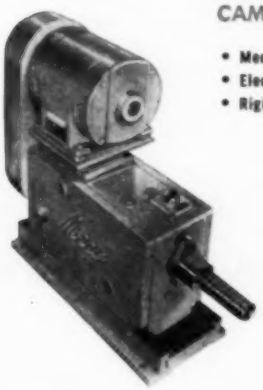
Also Air-Oil-Matic GUN DRILLING! Units equipped for automatic gun drilling . . . or standard gun drilling machines . . . now available.

RADIAL DRILLS
9" and 11" Models



Heavy and light production radial drills feature centralized controls for ease of operation, fast production.

CAM-MATIC DRILL UNITS



- **Mechanically Driven**
- **Electrically Controlled**
- **Rigid Quill Construction**
- **Exclusive Electric Clutch**
- **Adjustable Thrust Control**
- **Capacity to 1⅛", Stroke to 6"**

MORRIS MOR-SPEED MACHINE TOOLS have been selected by the world's leading manufacturers for low-cost mass production of precision-made parts and assemblies. Write for details.

Morris

THE MORRIS MACHINE TOOL COMPANY
933 Harriet Street, Cincinnati 3, Ohio, U. S. A.

The Year Advertising Helped

This editorial message was first published by McGraw-Hill two years ago. It describes advertising's dramatic contribution to the American economy during 1954. The theme of the editorial—that advertising can help promote economic stability by stimulating sales at a crucial time—is even more pertinent today.

As our economy grows, it is constantly changing. The conditions business faces today are not the same in every respect as those it faced in 1954. But business again has the opportunity, through advertising and other selling efforts, to help sustain a high level of economic activity. At the same time, it will be building markets for the period of renewed expansion that is sure to follow.

This editorial is reprinted exactly as it appeared in 1956 except for minor editorial changes to bring it up to date. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C McGraw

PRESIDENT

McGraw-Hill Publishing Company, Inc.

IN 1954 we had a business recession in the United States. Sales fell about 4% during the year. If management had followed the historic pattern of business ups and downs, advertising volume would have fallen much further.

But in 1954 the volume of advertising did not fall. It increased over 5%, and expenditures in all major advertising media rose. Every effort was made to stimulate sales when sales were needed to sustain prosperity.

This was something entirely new under the sun. It had a powerful influence in making the recession of 1953-54 one of the mildest on record. It helped greatly to speed business on to the record-breaking levels it attained in the years 1955-57.

There are several reasons why America's business management attacked this decline in sales with more advertising. One of them grew out of the greatly strengthened position of the American consuming market. Consumers' income after taxes has been rising an average of over $10 billion a year since 1946, and this rising income is more widely distributed than ever before. Furthermore, consumers had piled up reserves of about $200 billion in cash or its equivalent. These reserves offered a new and powerful inducement to increased selling and advertising effort even in the face of a possible decline in consumer income. (At the end of 1957, consumer reserves were $225 billion.)

Taking the Longer View

However, the principal reason why a sales decline was attacked with increased advertising is management's new-found conviction that good advertising is essentially an investment in the development of a market. Successful development requires sustained investment. The inclination of business management to take this longer view is, of course, motivated

McGraw-Hill PUBLISHING COMPANY,

ABP HEADQUARTERS FOR

Kill a Business Recession

by the fact that the American market, with over 3 million consumers being added annually, is growing at a prodigious rate.

Ten years ago only a handful of companies had plans for investment in new producing facilities extending beyond the current year. Today almost all leading companies have investment programs running some years ahead. And keeping pace with these long-range investment plans has been the development of sales and advertising programs to reach tomorrow's greatly expanded markets.

Advertising's Key Role

This crucial role of advertising in providing driving power for our economy is gaining greater recognition every day. In his book, "People of Plenty," Professor David M. Potter of Yale University remarked: "Advertising is not badly needed in an economy of scarcity, because total demand is usually equal to or in excess of total supply, and every producer can normally sell as much as he produces. It is when potential supply outstrips demand—that is, when abundance prevails—that advertising begins to fulfill a really essential economic function."

Today abundance so completely prevails in the United States that it has been conservatively estimated that as much as a third of everything offered for sale falls in the realm of "optional consumption." That is, consumers can "take it or leave it" without any immediate personal inconvenience. But if they decide to "leave it," a terrific economic depression will not be far behind. In such circumstances, advertising—in which, in all of its forms, we are now investing over $10 billion annually—clearly is of crucial importance to our continued prosperity.

In performing its key role in past years, American advertising never realized its full potential. It successfully promoted sales. But it never was called upon to promote an overall economic stability as a direct outgrowth of increased sales.

By successfully promoting both sales and economic stability, as it did in 1954, advertising surely has added new strength to the American economy. It has also added a great new and constructive dimension to advertising itself.

One of the surest means of expanding your sales volume in today's industrial markets is through dominant advertising in the publications directly serving your major customers and prospects.

McGraw-Hill's business and technical publications can give you quick access to the men who initiate, specify and approve the purchases of industrial products and services. Because all are leaders in their respective fields, you are assured a maximum return on your advertising investment when you *concentrate* in the McGraw-Hill publications serving your most important markets.

INCORPORATED · 330 West 42nd St., New York 36, N. Y.

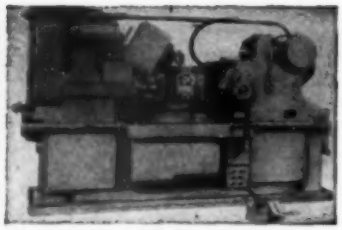
B U S I N E S S I N F O R M A T I O N

Here's what is meant by

"1·2·3"

in the

GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINE



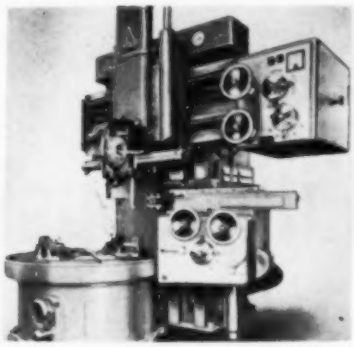
The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece simultaneously or in sequence, without changing set-up or rehandling. **It is the only standard machine that will do this.**

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS and DE LEEUW

MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

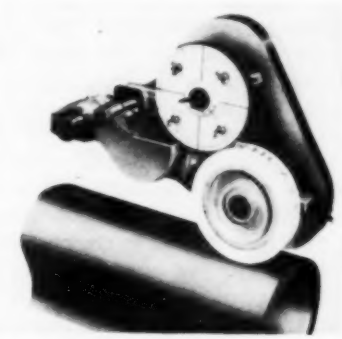


Vertical Boring and Turning Mill Available in Three Sizes

West-German-made Jungenthal is made in three sizes. Model DKE 800 has 35½-in. table, max turning dia 40 in.; DKE 1200, 43-in. table, capacity of 48 in. with side head, 51 in. above side head; and DKE 1600, 55-in.-dia table, turning capacity of 63 in. with side head, 67 in. above side head.

Table is mounted on ball and roller bearings throughout. Tables are guaranteed for unlimited loads and for true running between 0.00012-0.0002 in. Sixteen spindle speeds and sixteen feeds in various ranges are available. Automatic programming in 11, 16, or 24 variable operations is also available.

Distributed by Barer Engineering & Machinery Co, Ltd. PO Box 1180, Montreal, Canada



Industrial Offset Printer Fits Into Production Line

No. 248 offset printer, designed to provide continuous, lineal printing on steel, aluminum or plastic pipe, bars, tubing or similar products, mounts directly over a moving production line and is capable of printing on an unlimited range of product sizes from ½ in. OD.

Printing speeds up to 1000 fpm are possible. Larger character sizes can

Better Chains...

BEGIN WITH

SHARON QUALITY

CHAIN STEELS

Tough, rugged—yet ductile steels, developed and held to exacting specification, coil after coil—that's why chainmakers who once try Sharon Chain Steels become regular buyers.

If you are in the business of making chain, why not talk to Sharon metallurgists and take advantage of the first-hand knowledge of chain steels that comes from years of developing special alloys for the chain industry.

SHARONSTEEL

SHARON STEEL CORP.

SHARON, PENNSYLVANIA

12 AVENUES TO COST REDUCTION

with the "ALSOP METHOD" of

SUB-MICRON FILTRATION

The following cost reductions are substantiated by "in shop" tests:*

1. Increased production
2. Improved finish and controlled accuracy of work pieces
3. Reduction of coolant waste
4. Elimination of systems cleaning
5. Abatement of dermatitis in workers
6. Improved machine cleanliness
7. Prolonged accuracy of tools
8. Longer tool or abrasive wheel life expectancy
9. Reduced wheel loading and wheel dressing
10. Maximum recovery of precious (diamond) swarf
11. Reduced swarf handling and shipping costs
12. Reduction in parts cleaning costs

The "ALSOP METHOD" of sub-micron filtration on coolants, cutting oils and hydraulics is obtained with compact—large area—volume capacity units.

May we have our representative call and discuss a trial demonstration in your plant? No obligation of course.

A request on your letterhead will open these avenues for you.

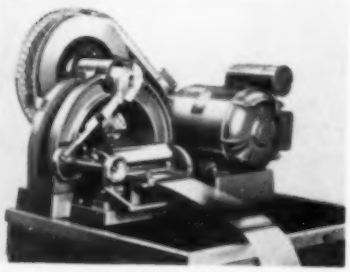
*Engineering Bulletins on Request

ALSOP ENGINEERING CORPORATION

1302 Liberty St., Milldale, Conn.

be used because the rubber printing roll readily conforms to the radius of the material being marked. Type wheels are available, providing a wide range of marking lengths.

Jas H Matthews & Co, 3704 Forbes St, Pittsburgh 13, Penna



Small Power Press is Equipped With Automatic Roller Feed

The British-made Abro power press is suitable for blanking, piercing, clipping, and embossing of light gage metals, plastic, wire and other light materials. The automatic feed accepts coil or strip stock up to 5 in. wide, and is variable over the feed range of 0 to 3 in.

Standard fixed stroke is ½ in.; ram adjustment is ⅝ in. Press is rated at 2½ tons, is driven by a ½-hp motor, and operates at 180 spm. Die bed measures 8 in. left-to-right and 5 in. front-to-back. The hole in the bed is 5 x 2½ in.

Press is supplied fitted with a pillar-type die set. Open tool height is 4 in.

Distributed by Wharton Unitools, PO Box 202, Valley Stream, LI, NY

Link-Type Variable-Speed Belt Adjusts to Any Desired Length

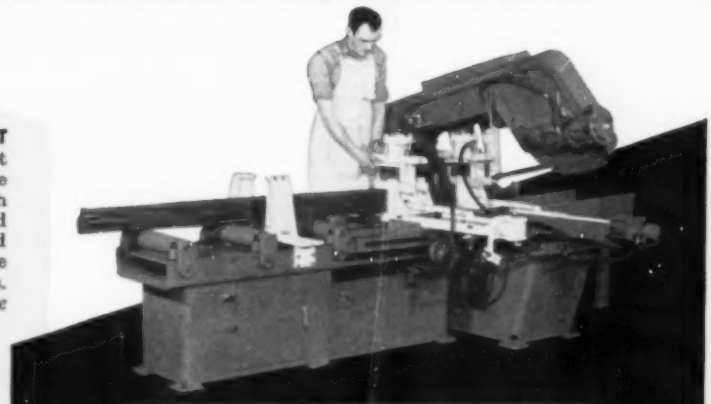
Known as the MVS belt, this variable-speed belt does not require dismantling of machinery for installation, is precision balanced to eliminate vibration, and can easily be adjusted for any desired length.

Made of heat- and oil-resistant neoprene, the belt is made up of a series of links held securely by special fasteners. It is available in a wide range of sizes to replace all types of variable speed belts.

Manheim Mfg and Belting Co, Manheim, Penna

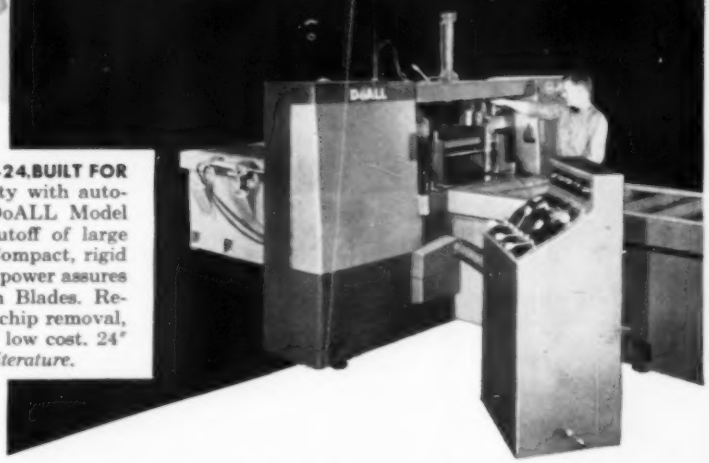
Before you buy any cutoff saw—
see these NEW DoALL POWER SAWS

NEW MODEL C-12, ACCURACY AT LOW COST Ideal for small shops or for intermittent production. Ample power and rigidity assure maximum performance from Demon High Speed Steel Blades. This model cuts mild steel at 10 sq. in. per minute. Unsurpassed for accurate machining of tough, expensive steels, pipe, structurals, etc. Four speeds. 12" x 12" capacity, manual control. *Write for new literature.*



NEW MODEL C-58, HIGH PRODUCTION, COMPLETELY AUTOMATIC World's fastest automatic cutoff sawing—easily adapted with standard attachments to meet any specific production requirement. Designed expressly for Demon High Speed Steel Blades. Infinitely variable speeds. 12" x 12" capacity. Also available in Model C-57, with manual control. *Write for new literature.*

NEW AUTOMATIC MODEL C-24, BUILT FOR YOUR BIG JOBS Giant capacity with automatic operation makes the DoALL Model C-24 excellent for low-cost cutoff of large billets, pipe and structurals. Compact, rigid design combined with extreme power assures full performance from Demon Blades. Reversible conveyors, automatic chip removal, automatic control available at low cost. 24" x 24" capacity. *Write for new literature.*



Ask About Our Lease Plan!

DoALL originated the leasing of machine tools. Its successful operation for many years can mean immediate savings to you. All DoALL machine tools can be leased at low rental with purchase option.

This is a typical DoALL Store

You name the cutoff job *and DoALL will show you how to cut it faster, cheaper and more accurately than any other machine can do today!*

Better still, DoALL will provide the exact type and size band machine you need to fit your budget—whether it's for smallest toolroom jobs or high-production runs.

DoALL *integrated design* is the secret—powerful, rigid band machines designed to get the full performance from world-famous DoALL Demon High Speed Steel® Blades. This engineered combination gives you up to six times the cutting speeds of other band saws . . . up to twice the speeds of power hack saws of comparable capacity. Find out *how* you can save time and labor, reduce cutting-tool costs, minimize material waste and hold down your capital investment. Call your DoALL Store today, or write The DoALL Company, Des Plaines, Illinois.

PS-12

THE DoALL COMPANY, Des Plaines, Ill.

"POP"® RIVETS

can probably save you money . . .

Even if your present fasteners are free!

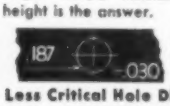
Greater Design Flexibility
No need for access to both sides.

High Clinching Action
Exerts as high as 600 pounds squeeze between parts.

Wide Grip Range
Same length "POP" Rivet holds tight through thick or thin.

Vibration Proof
"POP" Rivets cannot back out or become loose. No lock washers or nuts required.

Low Head Profile
Where space is important, "POP" Rivets' minimum head height is the answer.



Less Critical Hole Diameter
Designer wants holes tight, production wants holes larger. "POP" Rivets make both happy.

Least Back-Up Space
Strong, high grip "POP" Rivets need only enough back-up space to provide room for set head.

When buying fasteners, do you figure the *installed costs?* A fastener considered alone may cost very little but be very expensive by the time it's installed and becomes part of a finished product.

"POP" Rivets afford greater flexibility in product design. Often operations can be eliminated, assembly costs reduced, and speed of fastening increased.

Many users find high strength "POP" Rivets the most efficient and economical fastener for their product. Investigate its use in your application. Perhaps you too can enjoy the many advantages "POP" Rivets have to offer. Write us today.

"POP" RIVET DIVISION

UNITED SHOE MACHINERY CORPORATION
West Medway, Mass.

NEW SHOP EQUIPMENT

Vitrified grinding wheels, tradenamed Dayton Safety, come in standard sizes from 3 to 42 in. in diameter, with special sizes and shapes produced as required.

Simonds Worden White Co, 1101 Negley Pl, Dayton 7, Ohio

Vari-Pitch sheave, single groove "S" section, permits wider speed changes and increased horsepower transmission. It has a range of 5.5 in. minimum to 120 in. max. Designed to complement the present "Q" and "R" section models, the sheave requires no more mounting space than the smaller "R" section sheave.

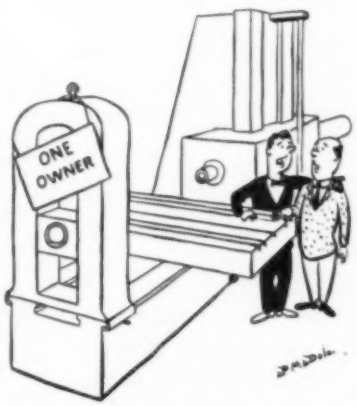
Allis-Chalmers Mfg Co, Milwaukee 1, Wis

HSS circular saws with extra fine teeth are 30 mm dia (1.118 in.) and have a ¼-in. hole. They are available in thicknesses from 0.10 mm (0.0039 in.) to 1.00 mm (0.0394 in.) by increments of 0.05 mm.

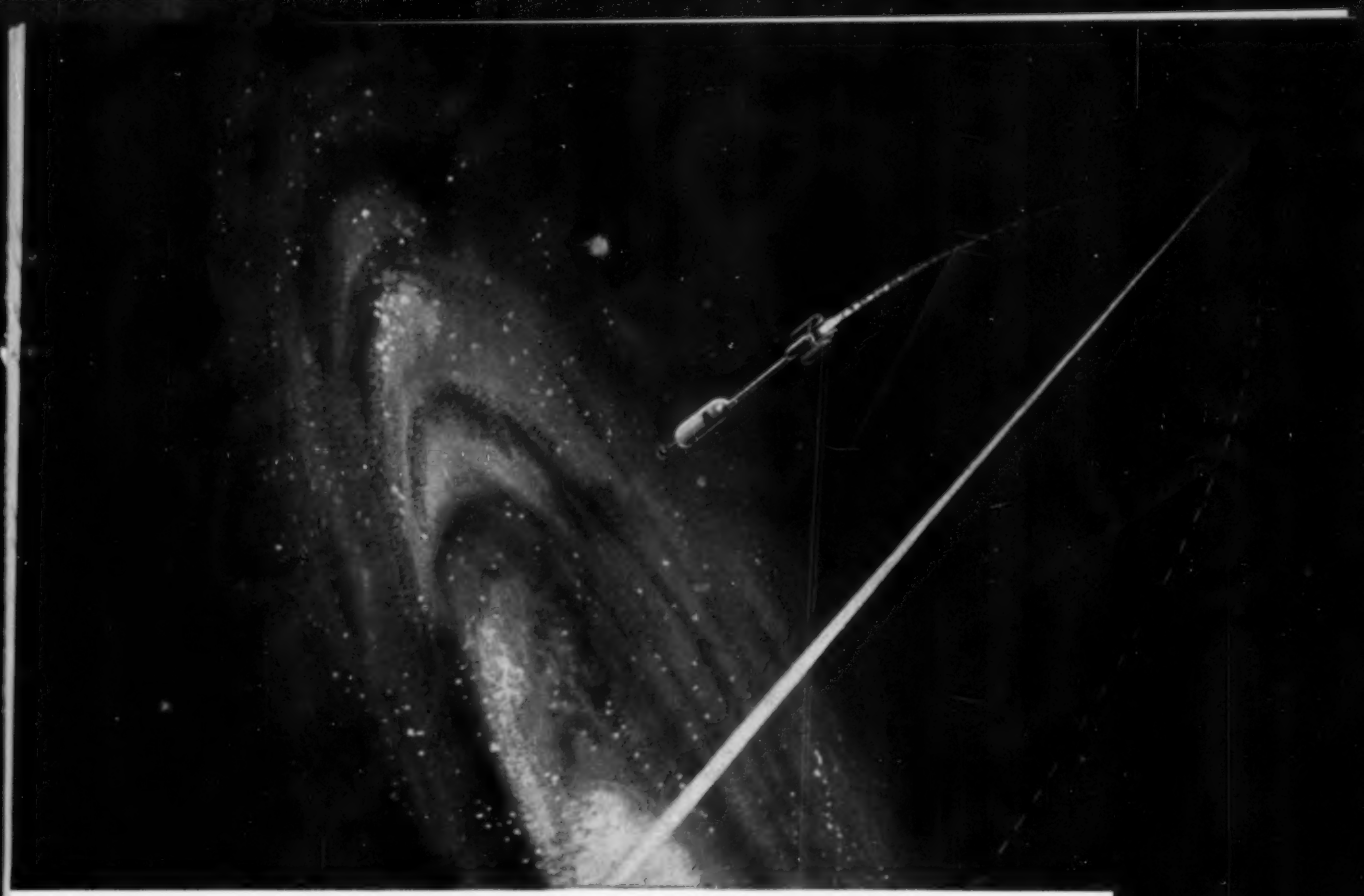
Louis Levin & Son, Inc, 3610 S Broadway, Los Angeles 7, Calif

Staggered-tooth slotting cutters, Series WAF, are designed for general-purpose milling. They feature flat-face HSS blades held in body by wedges. Two keyways permit cutter interlocking and lining up side teeth on adjacent sides when thin parts are straddle milled. Widths range from ⅜ to 1 in.; diameters from 4 to 16 in.

Goddard & Goddard Co, 18280 Burt Rd, Detroit 23, Mich



"For twenty years it was run by a little old man who just oiled it and sat down."



Precision TODAY to Gage TOMORROW'S Horizons

Current missile, atomic energy, and other similar projects are demanding gaging instruments capable of measuring with a precision thought impossible only yesterday . . . and of performing inspection jobs of extreme complexity. If *you* are engaged in missile or atomic development projects — or are planning to participate — you can count on Pratt & Whitney to design, develop and produce the special instruments you need.

We offer you a full staff of engineers and technicians, who have AEC and military clearance and work in classified areas. We also offer our proved ability as precision gage makers. We can develop gages to check components of any size or shape, and we can create gages fully integrated with business machines or other recording and analyzing devices. We are specialists in checking polar coordinates of contoured parts and in gaging miniature bearings and similar hard-to-inspect components.

Write, phone or call, and discuss your requirements with us. We're ready to start work now on gaging instruments for your projects. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

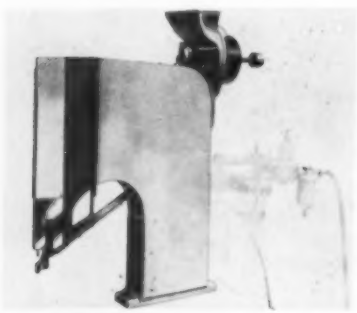
MACHINE TOOLS • GAGES • CUTTING TOOLS

Portable Radiography Unit Can Be Used on Steel Welds

Lightweight Model MG 100, said to provide sharp radiographic detail, is powerful enough for tasks involving steel welds and opaque materials such as aluminum, magnesium, plastics.

The 45-lb unit is housed in a steel case measuring 16 x 12 x 6¾ in. It is connected to the tubehead through a flexible multi-conductor cable. Kilovoltage regulation is stepless and continuously variable from 30 to 100 kvp. It is designed for virtually continuous operation. At full load, 100 kvp at 4 ma, it can be operated 50 minutes. X-ray generator and tube are enclosed in a shock-proofed, radiation-proofed steel tank weighing 55 lbs. The 1-mm focal spot is eccentrically located within the tubehead, closer to the port, permitting shorter focal-film distances. Radiation angle of 42 degrees allows extra wide field coverage.

Philips Electronics, Inc, Instruments Div, 750 S Fulton Ave, Mount Vernon, NY

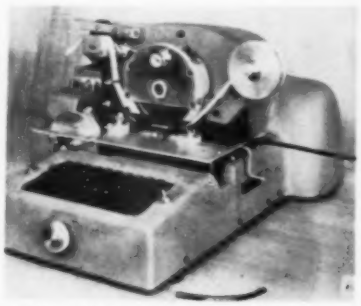


Bench-Model Pneumatic Riveters For High-Speed Production Lines

Machine that measures 25 in. deep x 3¼ in. wide sets tubular-steel rivets up to 5/32-in. dia and ¾ in. long on centers as small as ¾ in. Units can be used in conjunction with in-line slide fixtures or rotary transfer tables for progressive, high-speed production assembly operations and can also be used as bench or pedestal models in job shop applications.

Actuated by a pneumatic cylinder that drives the setting tool through a toggle linkage, models will operate off shop air from 60 to 150 psi. Cycling speed at the high end is limited only by rate at which rivets drop from feed rail into the jaws and speed of stroke can be adjusted to control impact on fragile materials. Throat depth is 9 in.; stroke is 2 in. Since they are controlled by solenoid actuated pneumatic valves, machines can be arranged for automatic cycling and part feed. Rotary hopper is standard equipment.

Milford Rivet & Machine Co, Milford, Conn



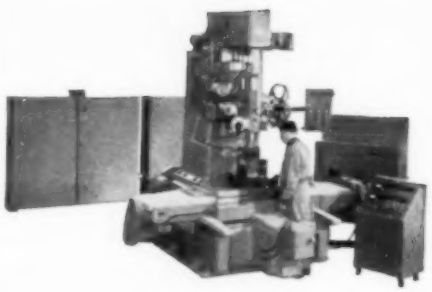
Keyboard-Operated Marking Machine Marks Wire and Tubing

Wire and tube marking machine, Model EMW-1, is operated through an electric keyboard. The wire or metal tubing is fed from coil stock and passes between guides beneath the marking station. As the desired information is typed, the material is automatically fed into the machine and spaced, giving clear, clean marks.

The machine also has an adjustable cutoff mechanism which may be operated automatically or manually. The branding head is thermostatically controlled and may be set for temperatures as high as 800 F (temperature setting is accurate to within 20 F and remains constant during operation). A foil feed is part of the branding mechanism; foil guides insure proper location of foil over the marking station.

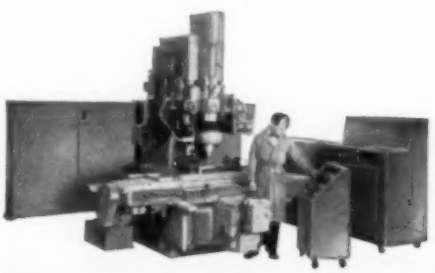
Depth or pressure necessary to mark material is adjustable. Over 100 characters per min can be typed. Tubing from 1/16 to over ½ in. dia, and wire of 18 gage and even greater can be handled. Standard characters from 1/32 to ¼ in. are available.

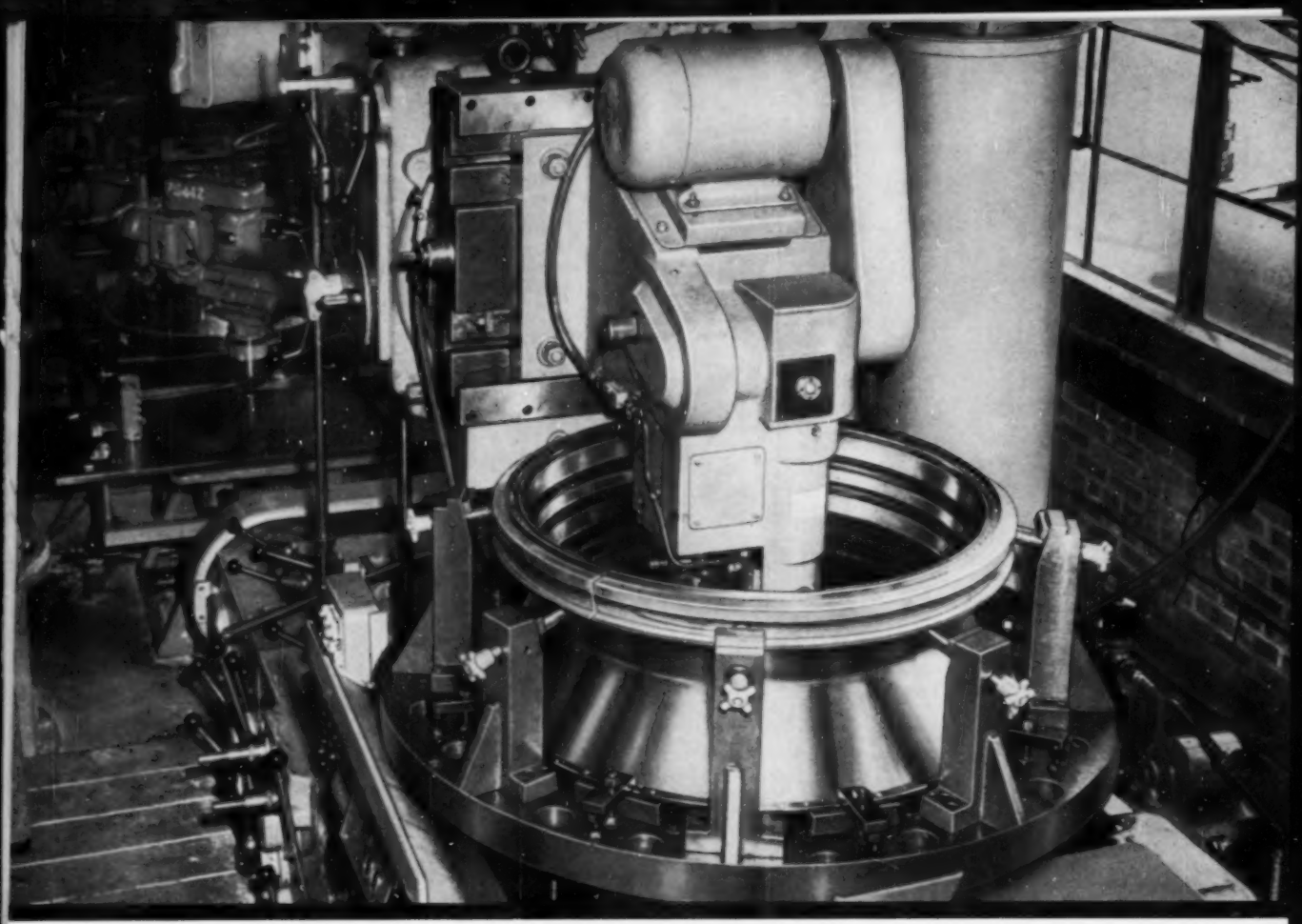
Defiance Machine & Tool Co, 1920 S Vandeventer Ave, St Louis 10, Mo



OTHER P&W NUMERICALLY CONTROLLED MACHINE TOOLS

. . . include the Electrolimit Jig Borer and the Vertical Precision Hole Grinder.





NO MISTAKES with NUMERICAL CONTROL

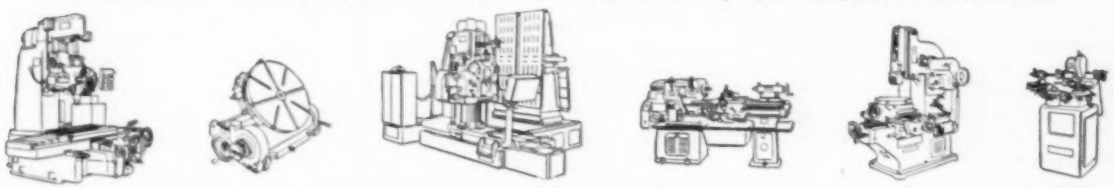
. . . and Machine Time Cut 46%!

These were the results when a Pratt & Whitney Numerically Controlled Rotary Table was put to work by Lycoming Division of AVCO Manufacturing Corporation. This job involves milling 236 slots accurately located on three rings within jet engine cases. Directed by a punched tape, the new table automatically indexes the work for each cut. Indexing is accurate to 5 seconds of arc. In addition, the table's numerical control system governs the milling feed motions . . . putting the entire operation on an automatic cycle.

Replacing a hand-indexing rotary table, the P&W Numerically Controlled Rotary Table has cut machining time 46%! Equally important, P&W Numerical Control eliminates operator error in locating the 236 slots . . . which would turn a nearly completed workpiece into scrap.

Lycoming's experience is no isolated example. Applied to P&W Rotary Tables, Jig Borers and other machines, Pratt & Whitney Numerical Control is producing equally spectacular time-and-money savings in many other plants. It may well offer opportunities for greater profits in *your* plant.

Write now for complete information. Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford, Connecticut.



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

PRATT & WHITNEY

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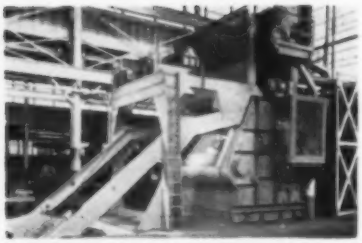
MACHINE TOOLS • GAGES • CUTTING TOOLS

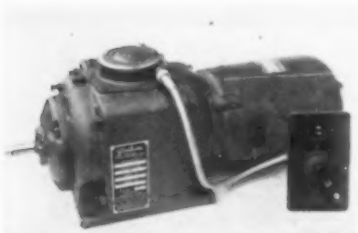


Rotoblast Barrel Introduced In 6-ton-Capacity Model

New 72-cu-ft unit is designed to blast-clean loads of castings, forgings, and heat-treated parts, weighing up to 6 tons, in five minutes, according to manufacturer.

The 72 Type GN barrel is equipped with two Rotoblast wheels, each capable of throwing 120,000 lbs of abrasive per hr. All operations including loading, starting, stopping, and unloading are automatically controlled from a panel. Scale, dust, and broken-down abrasives are removed from the abrasive after which it is returned to the wheel for reuse. Barrel is 21 ft 5 in. wide by 10 ft 11 in. deep by 23 ft high.

Pangborn Corp, Hagerstown, Md



Control for Variable Speed Drive Is Designed for Panel Mounting

This precision control for infinitely-variable-speed drives is designed for panel mounting at the remote station. It permits setting of the company's drive units to one part in 4000. Unit is available with standard lengths of cable from 1 to 6 ft.

One use pointed out by the company is the extremely accurate remote setting of speeds as required for machine tool feeds. Control can be used with any of the company's drives in sizes from 1/12 to 3 hp.

Graham Transmissions Inc, Menomonee Falls, Wis

Test Kit Permits Rapid Testing of Machine Tool Cutting Fluids

The Stinson test kit makes it possible to spot test various types and mixtures of coolants on the job without the need to drain and refill the entire machine system. Kit contains a 20-oz graduated beaker, stirring spoon, 16-oz bottle of Stinson X-32 cutting fluid and a 16-oz bottle of X-50 soluble oil concentrate. Bottles are the plastic squeeze-type and have jet nozzles to provide simulated machine flow of fluid directly on work. A dilution chart gives proper proportions for various operations on a variety of materials. Kit sells for $5 and is packaged in a serviceable canvas zipper case.

Philip M Stinson, Inc, 8774 Grinnell, Detroit 13, Mich

Tool Finishes Drilled and Reamed Holes to Close Tolerances

Known as the Gizmo, this tool is reported to produce perfect holes which can be held to extremely close tolerances. It does this through a combined burnishing and compressive action which stresses the material being worked beyond its elastic limit as the tool is fed into the hole.

The tool is fed into a previously drilled and reamed hole. Either the part or the tool rotates. It may be used in automatics, lathes, drillpresses, etc., and is said to be particularly adaptable for finishing holes in nonferrous materials. Stock sizes range from 1/16 to 1 in.

Shearcut Tool Co, 7045 Darby Ave, Reseda, Calif

High-Strength Zinc-Base Alloy Cuts Weight of Metalforming Dies

A new high-strength zinc-base alloy known as Hi-Phy Kirksite is offered as a premium tooling material. It supplements company's Kirksite-A and is reported to cut die weights up to 20%. Stamping and forming dies made of the new material are said to have a much longer life.

Higher physical and mechanical properties of Hi-Phy Kirksite are typified by the 400% greater impact strength it possesses over Kirksite-A. Tests show a greater hardness, substantially refined grain size, improved resistance to creep, higher tensile compressive strengths.

Morris P Kirk & Son, Inc, Subsidiary of National Lead Co, 2717 S Indiana St, Los Angeles, Calif

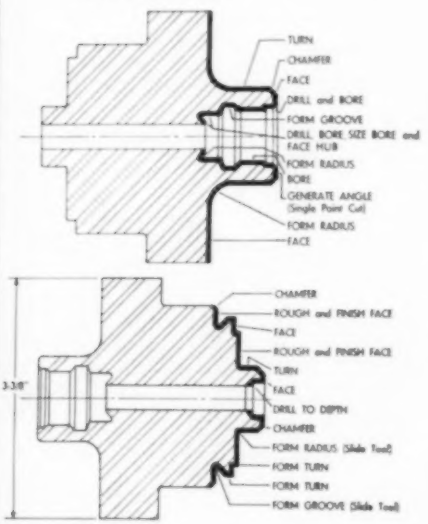
Let me show you*

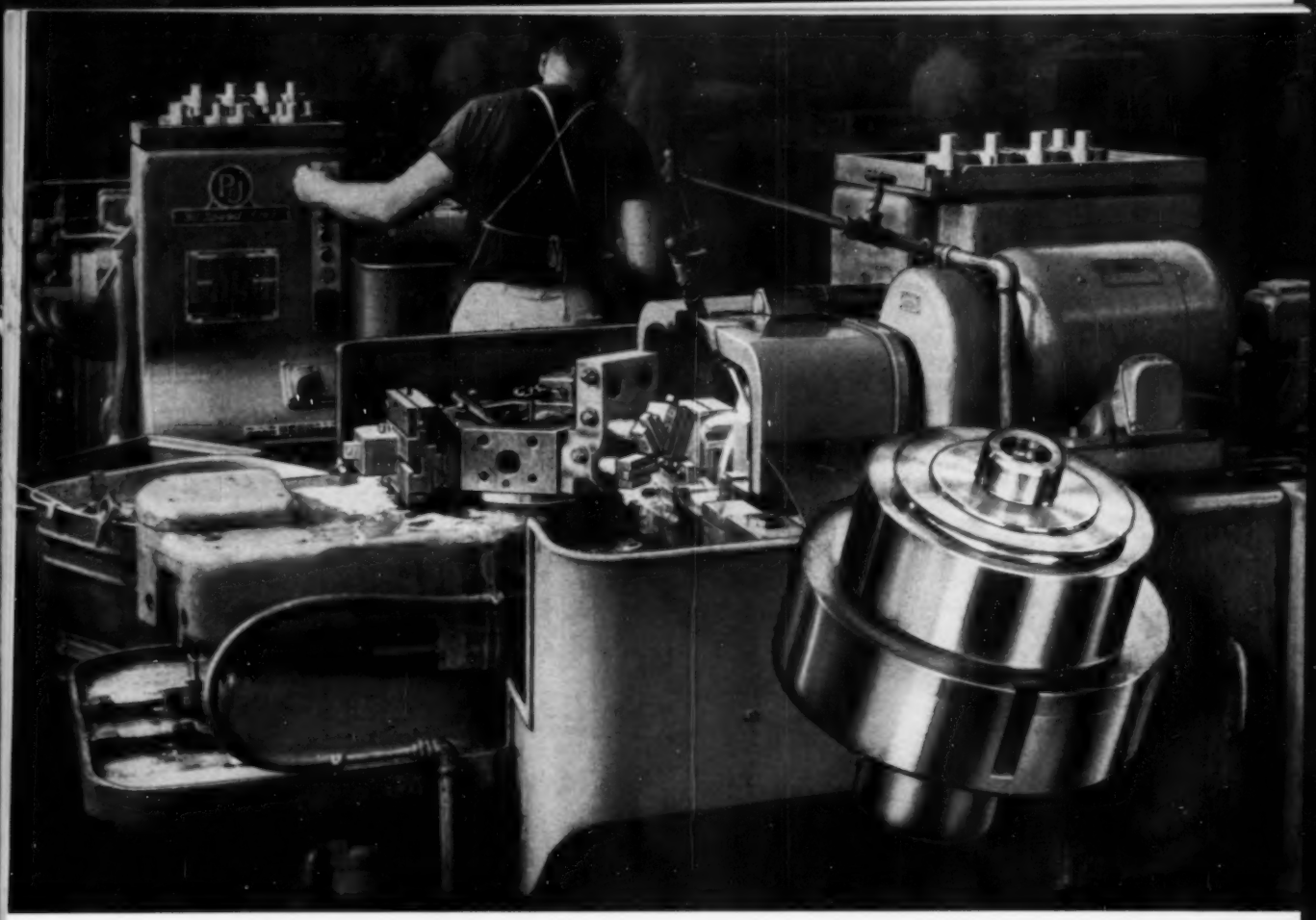
* *George Marr,*
P&J Representative
Pawtucket, R.I.
Telephone PAwtucket 5-6500

how a change to our P&J Automatics helped American Bosch . . .

JOB FACTS:

PART: *Head for Diesel Engine Fuel Pump.*
MATERIAL: *Nitralloy G, 28-35 Rockwell C.*
REQUIRED: *25 separate turning, facing, boring and forming cuts, with most surfaces held to .0015".*
THE MACHINES: *2 P&J 3-U "Speed-Flex" Automatic Turret Lathes.*
THE RESULTS: *Part completed in 2 fully-automatic cycles. Floor-to-floor time 5.5 minutes!*



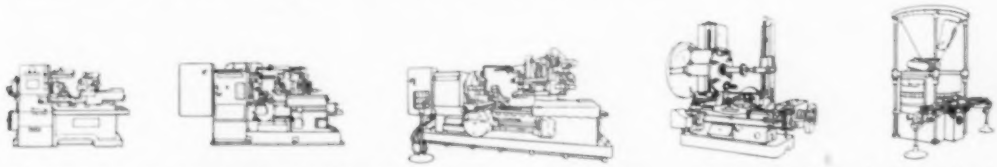


. . . . **INCREASE PRODUCTION 45% AND REDUCE MAN-MACHINE HOURS 75%!**

American Bosch Arma Corporation, one of the leading producers of automotive, electrical and diesel injection equipment, was using hand turret lathes to machine close-tolerance fuel pump heads. Two of these lathes – each with an operator – were working two 8-hour shifts per day, and a plant-wide survey showed that machining time and costs were too high. Called in to analyze the problem, we recommended two of our P&J 3-U "Speed-Flex" Automatics, with *both* machines to be operated by *one* man on a single 8-hour shift per day.

On the job 18 months, this installation has practically paid for itself in labor savings alone. Now, when the operator receives the workpiece, he chucks it in the first machine, and 12 cuts are completed in a single fully-automatic cycle. He then chucks the part in the second machine, and the remaining 13 cuts are completed. Floor-to-floor time is just 5.5 minutes . . . a 45% reduction over the old method. And 3 machinists have been released for other work.

If your manufacturing operations involve high-speed parts production, a switch from hand machines to P&J Automatics can also bring important benefits to you. Act today. Ask the P&J Representative in your area to analyze your requirements and recommend a production plan that meets your specific needs. If you prefer, write direct to Potter & Johnston Company, Pawtucket, Rhode Island.

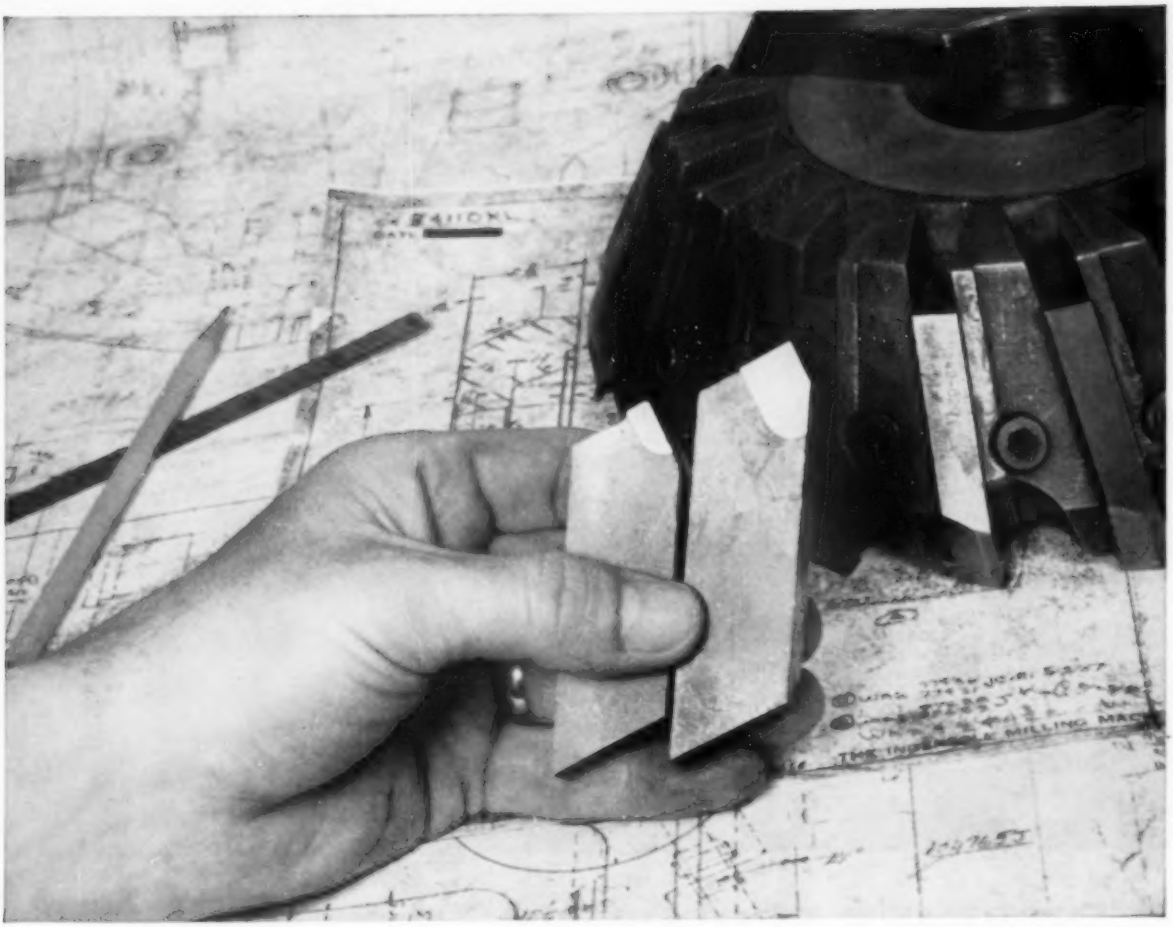


AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898



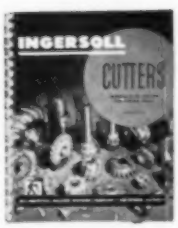
Ingersoll Cone-Type Face Mill for general purpose milling . . . designed for low replacement blade cost.

Do You Get Your Money's Worth?

Most of the carbide in the worn blade was used, but this in itself does not mean that it was used effectively. Many factors are involved in developing the lowest milling cutter cost consistent with improved finishes, faster feed rates and longer tool life.

A continuous review of these factors is part of the day-to-day responsibility of your Ingersoll cutter salesman and of the staff of milling experts he represents. This part of our product has proved its value to hundreds of concerns.

We will welcome an opportunity to tell you more about this service. Write:



If you do not have a copy of this book, write us and we will send you one. It describes in detail the complete line of Ingersoll inserted blade milling and boring tools. Ask for Catalog 166K.

CUTTER DIVISION

THE INGERSOLL MILLING MACHINE COMPANY

505 FULTON AVENUE ROCKFORD, ILLINOIS

William F Wilson, executive vice president and general manager of Gear Grinding Machine Co, Detroit, has been elected president of the company. He succeeds **Edgar D Leon** who has resigned from active duty but will continue as a consultant.

Frank G Helander has joined Loewy-Hydropress Division of Baldwin-Lima-Hamilton Corp, New York. He was formerly manager of the Hydraulic Press Division of Birdsboro Steel Foundry & Machine Co.

J V Naish has been elected president of Convair Division of General Dynamics Corp, succeeding **Gen Joseph T McNarney** who will continue as a consultant. Mr Naish, formerly executive vice president of Convair, has also been named a senior vice president of General Dynamics

NAMES IN THE NEWS...

William H Shenkle, chief engineer of Rockwell Manufacturing Co's Instrument Division at Tulsa has been promoted to general manager. **Philip E W Goodwin, Jr,** general manager of Rockwell's Sulphur Springs, Texas, valve plant has been appointed head of the new valve plant at Kearney, Nebr.

Arthur W Kurz, Jr, has been appointed manufacturing manager of Congress Die Casting Division and Congress Drives Division of the Tann Corp. Prior to joining the firm Mr Kurz was general manager of Advance Plating Co, Detroit.

Walter D Kramer has been appointed general manager of Timken Roller Bearings Co's Columbus, Ohio, plant. Formerly factory manager, he succeeds **Leroy D Gable,** who has retired.

E U Da Parma has been appointed executive vice president of Sperry Gyroscope Co. Formerly vice president, operations, of all product divisions, he succeeds **Dr C A Frische,** recently named president.

W Burt Carter has been named general manager of the Penco Metal Products Division of Alan Wood Steel Co, Oaks, Penna. He was formerly general superintendent of maintenance of all Alan Wood plants.

Max B Roosa, formerly vice president, sales, has been elected executive vice president of Parker Rust Proof Co, Detroit.

Robert B Lynch has been named plant manager of Taco Heaters, Inc, Cranston, RI. He was formerly associated with Textron Inc.

Fred A Schubert has joined the Cyril Bath Co, Solon, Ohio, as superintendent of the Contour Forming Division. He was formerly associated with Curtiss Wright Corp, Woodrich, NJ, where he was in charge of the sheet metal section in production engineering, supervising the processing of jet engines.

Roy P Jackson has been appointed assistant to the vice president of Aeronutronic Systems, Inc, California subsidiary of Ford Motor Co. Mr Jackson was formerly chief engineer of the Northrop Division of Northrop Aircraft, Inc, where he directed the engineering of the Snark intercontinental missile.

Paul J Linebarger has been promoted from assistant plant manager to plant manager of the Electronics Division of Rheem Manufacturing Co, Rivera, Calif.

Esmonde J Bushey (left) has been promoted from chief engineer to assistant works manager of the Union Twist Drill Co, Athol, Mass, Division. **Francis E Holland** has been appointed assistant sales manager of the Butterfield Divisions at Derby Line, Vt, and Rock Island, Quebec. Formerly district manager of Ontario sales, his duties will include direct responsibility for sales in Canada

Reginald E Brackett has been appointed assistant sales manager of L S Starrett Co, Athol, Mass. He will continue to head the company's Dial Gage Division

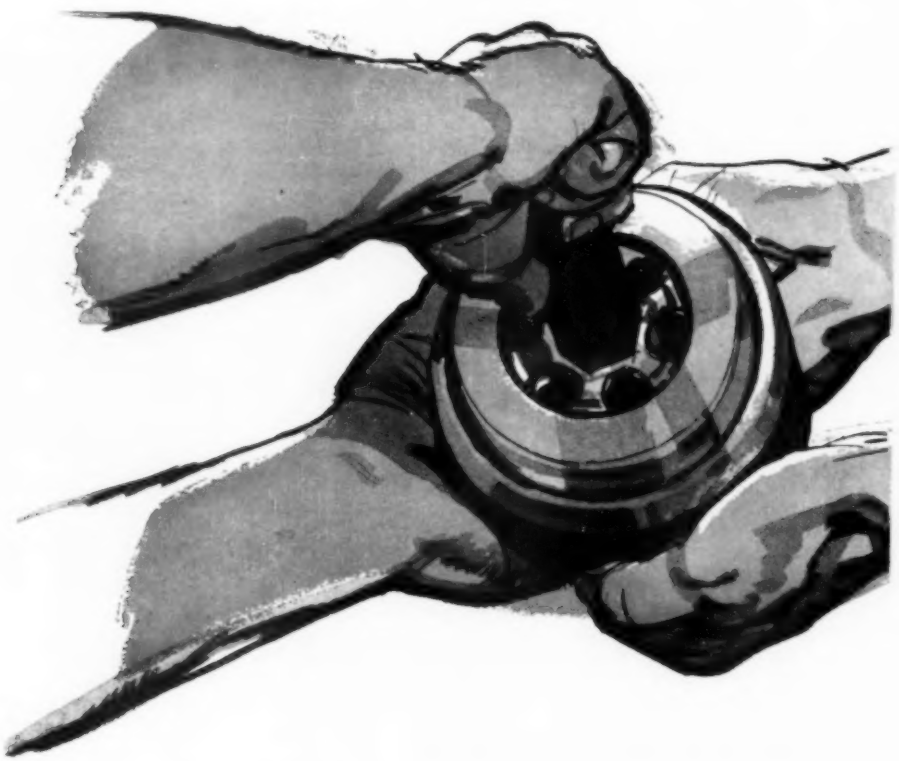
Look what

production increases

this company got with

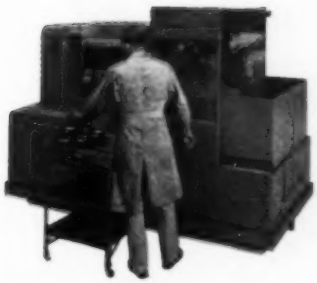
STANICOOL
HD Soluble Oil

PRODUCTION MANUFACTURING COMPANY DOUBLED NUMBER OF THREADS CUT BETWEEN CUTTER SHARPENINGS, SCORED OTHER PRODUCTION GAINS



Situation: O. C. Patterson, vice president of Production Manufacturing Company, Tulsa, wanted to cut down on the number of metalworking products used in the plant. He wanted to use just one oil for cutting SAE 1025 steel, screw stock and SAE 440 stainless steel.

Action taken: Checking with Standard Oil lubrication specialist, R. J. MacMurray, Mr. Patterson learned about STANICOOL HD Soluble Oil. A test was set up on a Warner & Swasey automatic bar machine. Roger MacMurray helped set up equipment for the test and helped work out the right STANICOOL HD and water mixtures for the types of metal used. A 4:1 mix for 1025 steel, and up to 10:1 for other metals and jobs was decided upon.



What happened: Parts were threaded on the bar machine that Production Manufacturing had previously been unable to thread. On a new Warner & Swasey AC chucker, it was found STANICOOL made possible threading at a speed of 35 surface feet per minute. With STANICOOL HD 150 threads could be cut before the cutter needs to be sharpened. Only 75 threads could be cut before. Plant management found STANICOOL also protected work from rust while it went through many additional shop operations.

To find out more: All the facts about STANICOOL HD Soluble Oil are yours. Just call your nearby Standard Oil lubrication specialist in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Illinois.**

No trouble. Pressure coupling is checked by O. C. Patterson, vice president of Production Manufacturing, Standard Oil's Roger MacMurray and foreman Byron Finley. Roger MacMurray helped the men in this plant find a new route to production increases with STANICOOL HD Soluble Oil. That's his job, and he's well equipped for it. Eight years' experience in such work, an engineering degree from the University of Colorado and completion of the Standard Oil Sales Engineering School are his qualifications.

Quick facts about

STANICOOL HD Soluble Oil

- Has E. P. and oiliness properties comparable to cutting oil.
- Contains germicide that controls bacteria build-up.
- Is nonirritating to skin.
- Protects machines, tools and work against rust and gumming.
- Will not gel in cold weather, has excellent emulsion stability.

You expect more from STANDARD and get it!

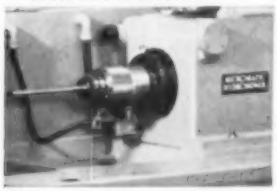
WHY "150" HYDROHONER

Reduces Costs . . .
Assures Controlled Finish . . .
Provides Rapid Stock Removal

To assure rapid stock removal and consistent generation of surface finish desired, the low-cost "150" Hydrohoner utilizes the distinctive Microhoning characteristic of self-dressing abrasives. Because abrasive grits are kept sharp-cutting at all times by a combination of controlled pressure and reciprocating-revolving motions of tool, a constantly high cutting efficiency is effected.

Basic "150" Hydrohoner —delivered from stock.

Microsize gage automatically ends cycle when exact size is reached.



Microdial automatic feed control and stone wear compensation.

Possessing a 12-inch stroke and a work diameter capacity of 1½ inches, the standardized "150" readily accommodates a variety of fixturing and tooling to assure easy adaption to a wide variety of work parts. Also, by addition of standard packaged units produced by Micromatic, it can be partially or fully automated.

Performing to the standards of higher-priced, special-purpose honing machines and incorporating features of a general-purpose design, the "150" Hydrohoner is an economical, long-range investment for long or short production runs.

Send Coupon for Complete Information.

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____ J

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

NAMES IN THE NEWS...

Robert S Root has been named chief engineer of both the Clutch Div and Machine Tool Div of Lipe-Rollway Corp, Syracuse, NY. Formerly chief engineer of the Clutch Div, Mr Root succeeds **E R Fish** as chief engineer of the Machine Tool Div

A J Thoma, controller of Air Reduction Co, Inc, has been elected vice president and controller.

J H Dalton, formerly vice president of Fairchild Camera & Instrument Corp, has joined Servo Corp of America, New Hyde Park, NY, as assistant to the president.

Lawrence L Jacobs has been promoted from plant superintendent to plant manager of Aeroquip Corp's Elbeeco Division, Jackson, Mich.

Roy Prochnow has been promoted from factory manager to assistant to the director of operations for Clearing Machine Corp, a division of US Industries, Inc, Chicago

D M Heller and **R E Whiffen** have been appointed assistant general managers of the missile section of Bendix Aviation Corp's Products Div. Mr Heller was previously director of engineering, and Mr Whiffen plant manager. **W P Bollinger**

has been promoted from assistant director of engineering to director.

Ernest Swaine has been elected president and general manager of Dixie Tool Co, Bridgeport, Mich

William Glynn, assistant to the factory manager of Bullard Co, has been appointed to coordinate the customer machine rebuilding program recently established by the company.

Dan E Harrison has been appointed vice president and general manager in charge of the Midwestern Division of True-Trace Sales Corp, El Monte, Calif, manufacturer of hydraulic and machine tool controls. Formerly divisional general manager, he will direct operations of the Racine, Wis, and Westbury, LI, NY, plants.

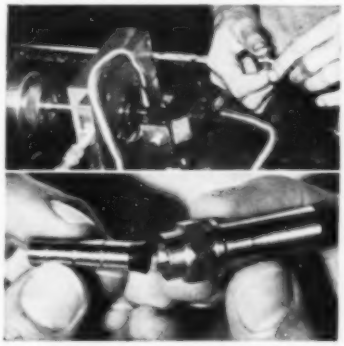
Charles E Peters has been appointed plant manager of the Beatty Machine & Manufacturing Co, Hammond, Ind. He was previously associated with divisions of US Industries, Inc

Alex M Stewart has been appointed manager of magnetic sales and engineering, Fawick Airflex Division, Fawick Corp, Cleveland. He will be responsible for sales and engineering of new electric clutches and brakes for machine tools and automatic machinery.

HOW Manufacturers Use "150" HYDROHONER To Reduce Costs...Control Finish... Obtain Rapid Stock Removal

Leading Manufacturers of precision parts are using the low-cost "150" Hydrohoner to secure high production, rapid stock removal, geometrical precision and controlled surface finishes. Indicative of the versatility for application of this highly efficient honing machine are the following recent installations:

The crankpin bore of a compressor connecting rod is Microhoned on a "150" Hydrohoner within tolerances of .00015″ for taper, and .0002″ for size and out-of-roundness. From .0008″ to .001″ of stock is removed from the bore (.875″ diameter x .43″ long) in about 8 seconds, while obtaining an 8 Microinch finish.



In this installation, a "150" is Microhoning in two runs the bore (.313″ diameter x 1.375″ long) of a braking cylinder. The first run removes between .004″ and .006″ of stock in 30 to 35 seconds. During finishing run, the final .0005″ to .0008″ is removed to provide geometric accuracy within .0002″ tolerance and an 8 Microinch or better finish. Precision and controlled finish of bore prevent hydraulic oil leakage and minimize wear of neoprene-cupped piston.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

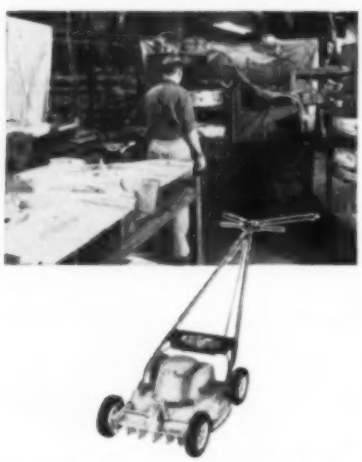
NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE_____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

RUGGED SALES APPEAL

In Monarch Aluminum Permanent Mold Castings

Monarch's "One Source" analysis of their end-product casting requirements enabled O. M. Scott & Sons Company to compare all casting methods before freezing final design. Monarch engineers helped determine that aluminum permanent mold castings would produce the best end-product performance.



Monarch's extensive services in casting, machining and finishing provided completed castings ready for Scott's assembly.

This is a typical example of Monarch's approach to more casting value per dollar. It is underwritten by vast experience in mass-production of aluminum permanent mold, aluminum die casting, zinc die casting—machining and specialized finishing. For details how it works write for our new brochure—Today.

MANUFACTURING in MOLTEN ACHIEVEMENTS ALUMINUM

MONARCH ALUMINUM MFG. COMPANY

9205 Detroit Avenue Cleveland 2, Ohio

Round Table...

MANAGER OR SUPER MECHANIC?

Does a foreman have to know everything about the equipment in his department—to the extent of being able to repair breakdowns—or should he concentrate on being a skilled administrator?

FROM the point of view of a former apprentice, a foreman only seems to have one purpose, that of distributing the work and channeling any ensuing problem to higher authority. His seems to be the position of one of the boys who was given an honorary title, more or less, of a group representative or spokesman. It is true that he qualifies for the job because he is a little more reliable, and has a bit more common sense than the rest of the gang, but his main task is that of a two-way distributing agent. In one direction he uses his good judgment to decide to whom the work should be allotted, what can be expected in return in quality, quantity, and time consumption.

When transfers are in order his supervisors respect his opinion but when a man is going to be moved in any manner, the brass makes the decisions, the foreman doesn't.

In the other direction he acts as a contact man between the hired hands and his boss. If they want a particular favor, such as permission to leave early of an afternoon, or any one of the special requests that can arise in the course of a day, he submits it to the proper person, but his own word isn't law. If one of his men has operating difficulties he might call on him for suggestions, but mainly because he has the time to give and may be more proficient at it because he's in the habit of giving advice.

A foreman cannot be expected to know everything but he can be expected to know a little about everything that goes on in his shop.

Neal A Mack
Belle Harbor, NY

"Looks like they finally negotiated a new contract!"

SCHOOL FOR NOVICES

Would a basic course in facts about the plant, the product made, and facilities for making it be of interest and value to the workers in the shop, or are shopmen generally disinterested in such information?

IN THIS AGE of ours with lack of all sorts of men who know something about engineering, it seems to me that every effort to educate the working force along these lines should be worthwhile. But if this "School for Novices" is only to give the workers a few simple principles of physics and mechanics so the new employees and those who don't know much about machines will get a vague idea of what's going on in Ed's and Al's shop, I think the time is wasted.

Any guy who doesn't know much about machines cannot possibly be ready to study physics and mechanics. Why not teach the fellows first how to read drawings and figure some arithmetic instead?

I agree with Ed that a course as short as one hour a week to learn engineering won't do much good and will probably give some lazy guy an opportunity to waste half an hour of company time. If the purpose of the course on the other hand is to give the men information about the company, the gain in good-will should be quite large.

Further, if it is only a way of promoting a personnel-relations program, lectures on what's going on in shop and office should be quite valuable. Questions about the plant and company policy could then be included. If a program of this type is followed, it would stimulate many, young and old, to do better and more work for their employer. If any company shows interest in its working force they will return this interest with an increased profit.

If the class turns to sex, it is time to change the instructor. I think Al's worry on that point is entirely

Parts made by almost every industry have holes made by a KINGSBURY

From the carburetor body to the lock cylinder . . . the bearing race to the hammer head . . . would just be a variety of parts — except for one important advantage in common:

the drilling and tapping operations were completed faster, at lower cost per operation, with unvarying accuracy — in every single part — because an automatic Kingsbury machine did them.

This can mean a distinct manufacturing advantage to *you*, if you have high production drilling, tapping, reaming, spot facing, light milling and similar operations to do on your parts. You can do them at the *rates you need*, at the *lowest practical cost, month in and month out*, on a Kingsbury indexing automatic.

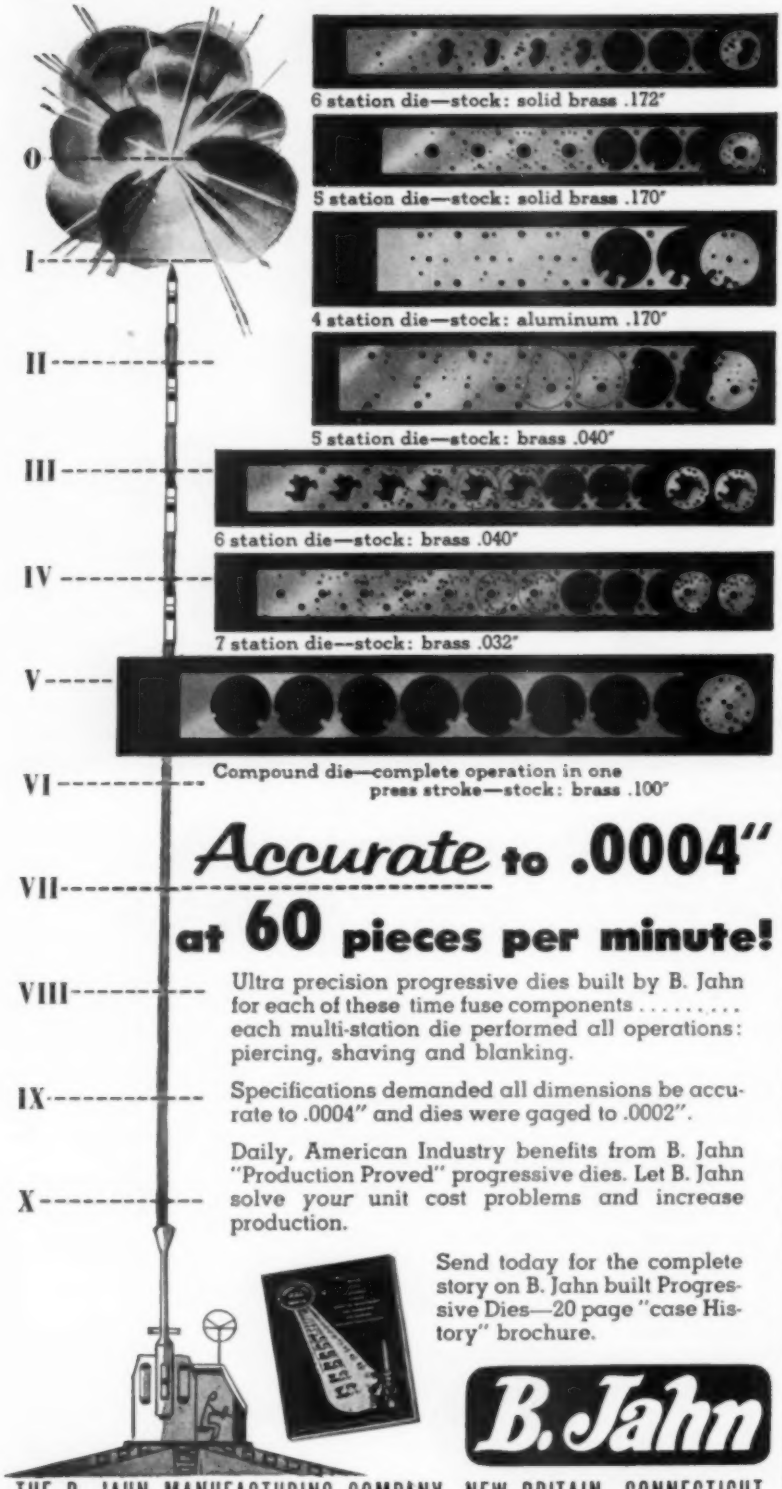
"Kingsbury jobs" — as the automotive and appliance industries frequently call them — are typically done in this manner: The manufacturer sends Kingsbury a print (or sample) of his part, specifying operations and the production rate required. Kingsbury then incorporates the appropriate standard operating units, base, indexing unit and drive, to build an automatic drilling and tapping machine *to do what the customer wants, at the rate he wants.* Test runs by Kingsbury *before* shipment, and *delivery of a fully tooled machine* ready to produce, provide positive assurance that performance will match production requirements.

Whether you make automotive, plumbing, hardware, machine, electrical appliance or some other kind of parts, investigate the production and cost benefits in doing the drilling and tapping on a Kingsbury. Send your requirements and questions to Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY

INDEXING AUTOMATICS
for high production drilling and tapping

TIME FUSE COMPONENTS



Accurate to .0004"

at 60 pieces per minute!

Ultra precision progressive dies built by B. Jahn for each of these time fuse components . . . . . each multi-station die performed all operations: piercing, shaving and blanking.

Specifications demanded all dimensions be accurate to .0004" and dies were gaged to .0002".

Daily, American Industry benefits from B. Jahn "Production Proved" progressive dies. Let B. Jahn solve *your* unit cost problems and increase production.

Send today for the complete story on B. Jahn built Progressive Dies—20 page "case History" brochure.

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

superfluous. The lecturer will stick to the subjects suggested by the company.

Night schools are absolutely necessary to supply mechanics and technicians to the industries. I have learned whatever I know about engineering that way myself by attending evening courses for six years. Ed doesn't say what night school courses are available in his town or city. Perhaps many a young man there must go to another city many miles away to get the education he desires.

Any course that applies to a particular plant must probably be conducted by the company running that plant. Such courses may also include engineering in general.

Yes Ed, why should not a course of this kind also be a recruiting ground for the company? Any good executive giving lectures to a class of this type may, from the questions asked, pick out men who would be suitable for further education and promotion.

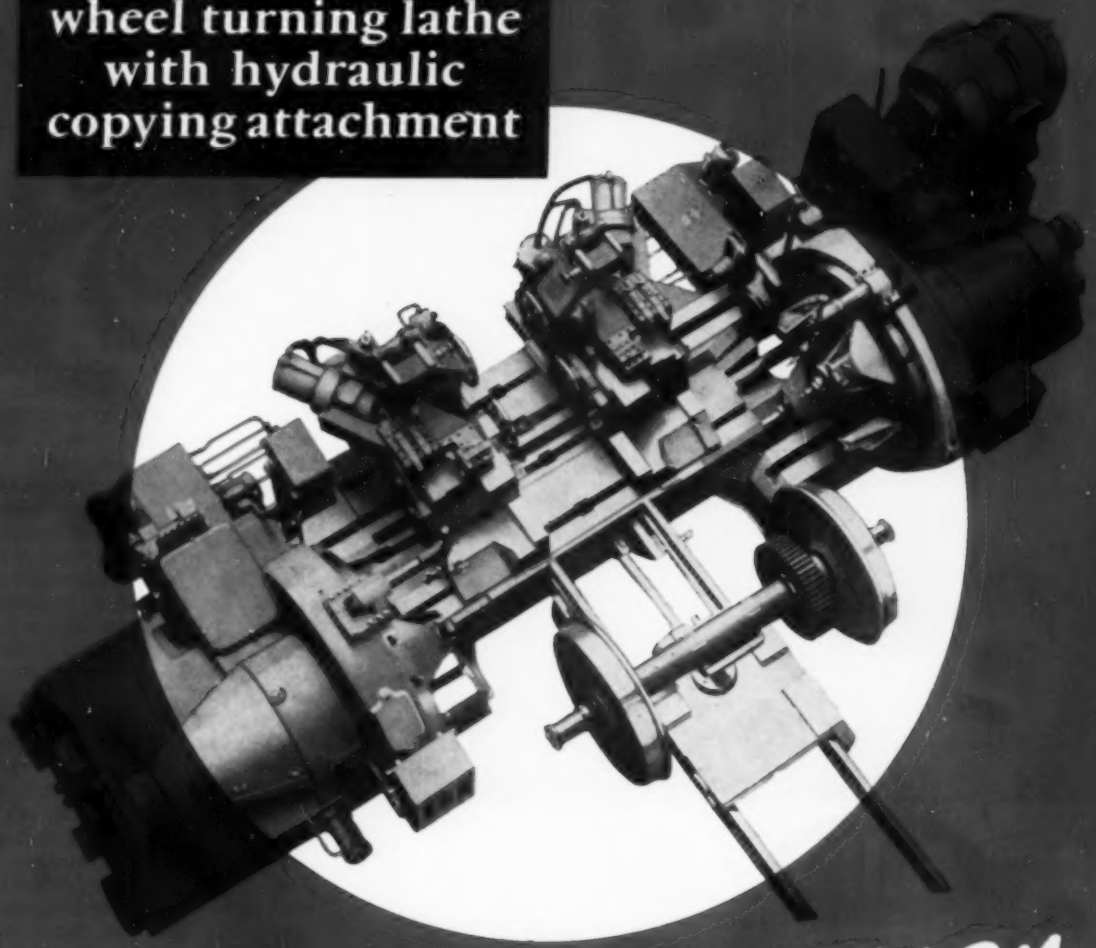
So there are many smart reasons for management to spend the time and effort. It is not only the workers who gain information about the company; management will also get information on the quality of its working force.

A E Fristedt
Stockholm-Bromma, Sweden

THIS ROUND TABLE topic might be titled: "School For Novices" or "How To Add On Overhead." It is clear with this implied indictment that I believe only very slight advantage could be had by a company adopting a plan of "educating" its

"M-my n-n-nervousness drove a time-motion study man nuts at the plant t-t-today."

A new automatic wheel turning lathe with hydraulic copying attachment

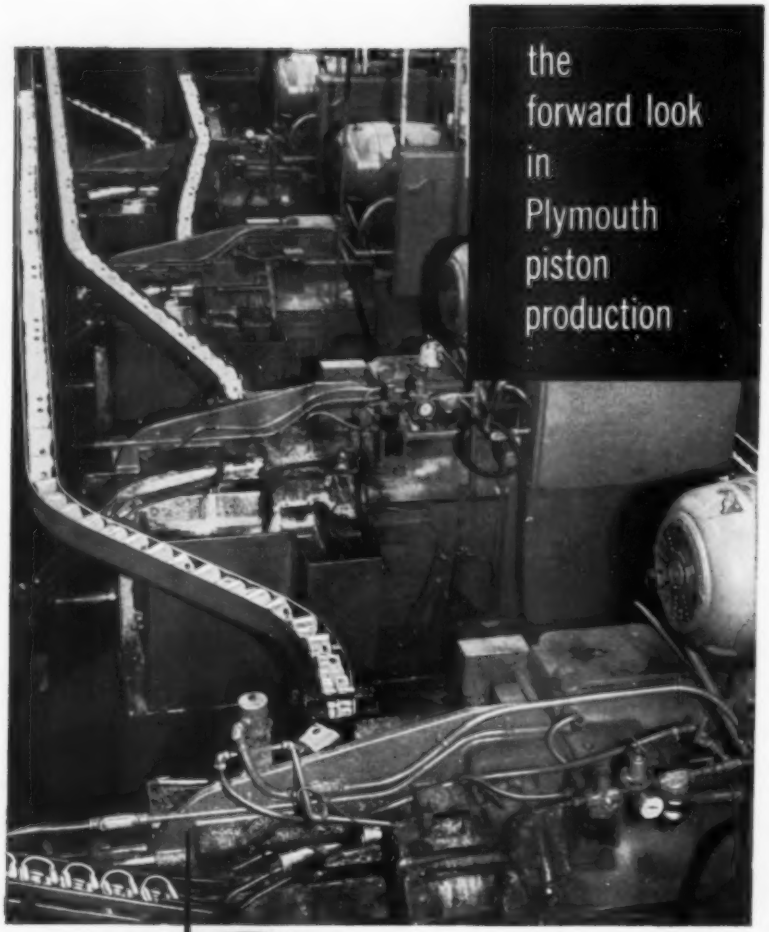


a pair of mounted wheels 37½ D.ia reprofiled in 6½ min.

Établissements
SCULFORT-FOCKEDEY VAUTIER & Cie
MAUBEUGE (FRANCE)

Write for bulletin 6417 and literature

TOUR Sculfort



Features **BAIRD**

COMPLETELY AUTOMATIC
HIGH PRECISION
CHUCKERS

Four Baird Model 76H Automatic Chuckers, at Chrysler Corporation's Mound Road Engine Plant, handle *all* Plymouth pistons on this new mechanized production line.
They rough and finish two cuts on the O. D.; rough and finish ring grooves; rough and finish two cuts on the dome; chamfer skirt and dome; face to length. With auto load and unload, aluminum pistons are finished in 8 seconds.
Chrysler Corporation is a long-time Baird chucker customer. Chrysler engineers know that Bairds meet the requirements in machining speed . . . in close tolerance quality of work produced . . . and in freedom from down-time.
If you can use the exceptional capacity and low-cost productivity of Baird 6-spindle and 8-spindle chuckers, write Dept. AM for more information.

THE BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

BAIRD — Six-and Eight-Spindle Chuckers • Automatic Multiple Transfer Presses • Automatic 12 Station Duplex Turning Machines • Vertical Continuous Lathes • Automatic Four Slide Machines • Pneudromatic Ribbon Metal Forming Machines • Barrel Finishing Machinery • Machinery for Chain and Roller Chain Production Garment Hook and Eye Production • Precision Bench Presses

employees as discussed in the topic on which I am writing. I do not pretend to be authoritative in expressing my opinion. For what it may be worth, however, I would like to explain why such a course for novices is not worth its bother and is actually inferior to the company-sponsored periodical.

This course might collect a few loafers as well as those willing to learn, but the worst aspect of the case against it is that it would be very likely misunderstood, and thus tend to be avoided by well intentioned employees, and become an expense to the company with no return, tangible or intangible.

On the other hand, employees' magazines (published at the company's expense) have been accepted by industry and its employees and, it is felt, do help promote unity, satisfaction, harmony, and stimulate interest by the employees in themselves as well as the company by the readable stories and pictures that must make up the magazine or "sheet," or whatever. What is more natural than that this periodical occasionally carry stories on technical aspects of plant operation or some explanation of company policies? All employees are reached this way.

It is true that many people working in industry tend to look upon such a company-sponsored periodical as propaganda. I believe that these people are somewhat short sighted and overly critical, but it is clear that if the company "paper" is suspected of brain-washing, if I may be permitted to use an overworked term, a company-sponsored course that does not teach an ac-

"No, if you can see them they're obsolete."

Get more welds per dollar with

MALLORY
seam welding wheels

Here are seam welding wheels with real stamina. Seam after seam, they roll out first-rate results . . . with little time out for dressing. Mallory makes two types.

FOR HEAVY DUTY. Mallory cold-forged wheels are produced through special Mallory forging techniques that give excellent uniformity, hardness and conductivity. They're made from a variety of Mallory alloys, stainless steel and other materials. These long-lived wheels give consistently fine welds and long service between dressings.

FOR MEDIUM DUTY, there's a line of seam welding wheels made of Mallory 3[R] Metal. Produced without the cold-forging operation, these wheels cost correspondingly less, yet serve well in many applications.

Both are available as rough forgings, or finished-machined to your specifications.

Your nearby Mallory distributor can help you choose the best wheel for your specific job.

Expect more . . . get more from

P. R. MALLORY & CO. Inc.

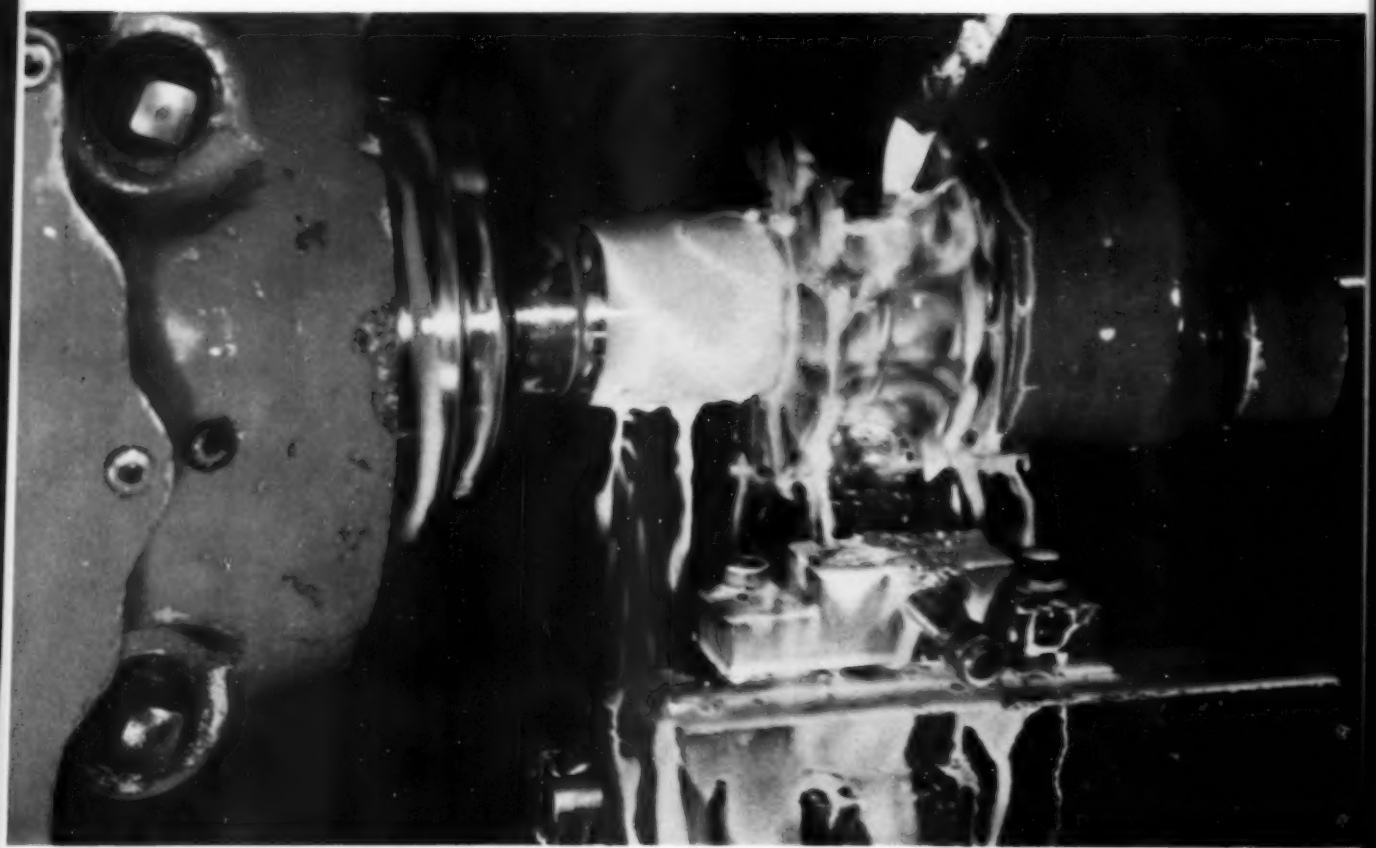
MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

FREE TECHNICAL DATA!

Write today for your copy of the latest Mallory Resistance Welding Catalog, or get one from your Mallory distributor.

Wheels and machines stay cleaner with emulsions of new S.E.C.O. Also, finishes are better.



Emulsions of new S.E.C.O. allow faster cuts with less tool wear.

Photos courtesy of
Peter Salmon Co., Glenside, Pa.

NEW EMULSIFYING OIL KEEPS MACHINES CLEAN, PROTECTS AGAINST RUST, GIVES IMPROVED HARD-WATER EMULSION STABILITY

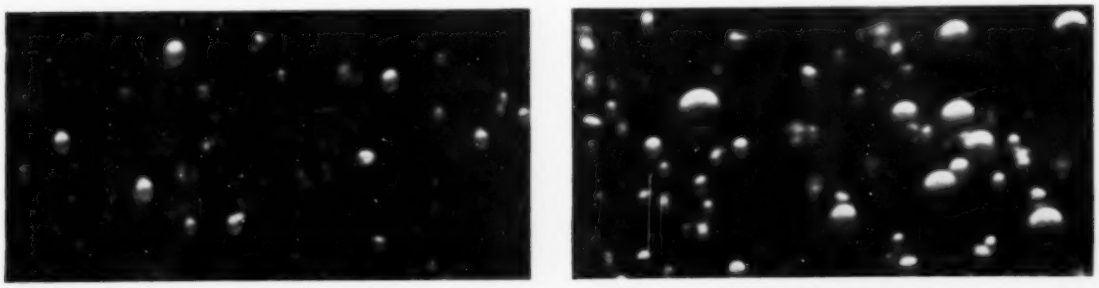
Emulsions of Sun's new S.E.C.O. (Sunoco® Emulsifying Cutting Oil) with smaller oil particle size give you the following benefits—

EMULSION STABILITY—In hard-water areas, impartial field tests show that emulsions of *new* S.E.C.O. stand up better under more severe conditions than those made with other regular emulsifying cutting oils.

DETERGENCY—The excellent wetting properties and detergency of *new* S.E.C.O. allow dirt and fines to settle quickly out of emulsions. Grinding wheels and machines stay cleaner.

RUST-PREVENTION—The smaller oil particle size in emulsions of *new* S.E.C.O. gives better metal wetting properties and increased protection against rust and corrosion. See photos below.

If you're a regular user of S.E.C.O., notice how much it has been improved. If you're not, find out what we mean about greater economy and improved production with *new* Sunoco Emulsifying Cutting Oil. Call your Sun representative, or write to Sun Oil Company, Philadelphia 3, Pa., Dept. I-9.



800x photomicrographs of 10% emulsions. *New* S.E.C.O. emulsion on left contains *8 times* as many oil particles per unit volume as ordinary emulsion on right. Many minute particles in S.E.C.O. emulsion do not show at this magnification.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

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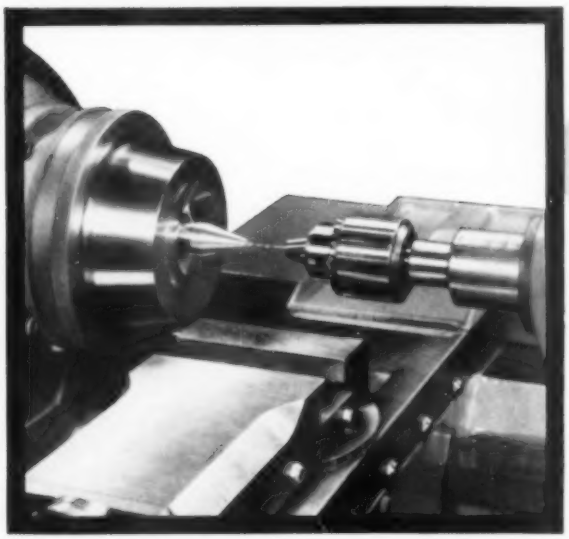
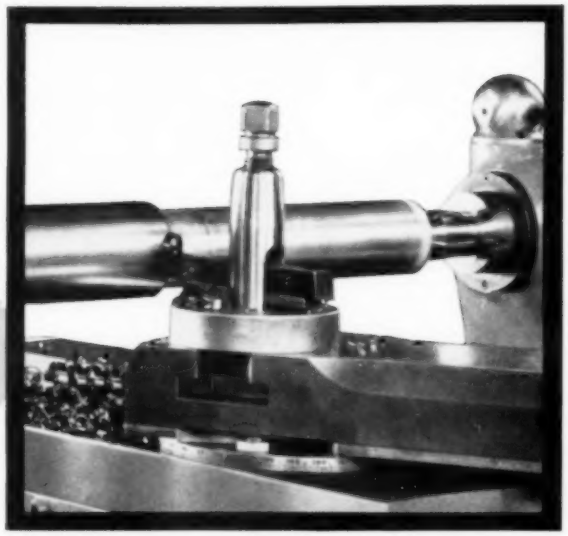
Rivett's 2 for 1 Lathe!



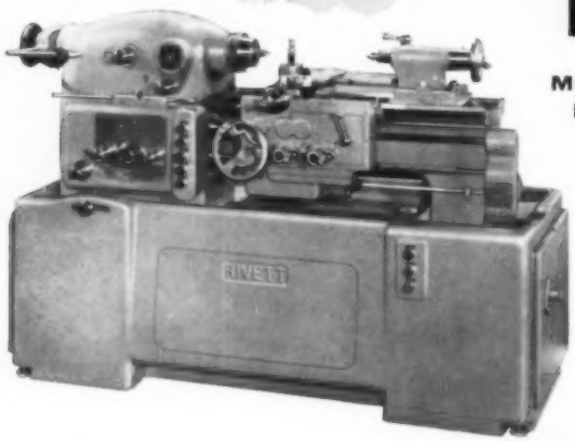
Sensitive...
As An Instrument Lathe

Responds to the lightest touch of the operator. Turns within .0004" in 12" length!



POWERFUL...
As An Engine Lathe

Full horsepower transmitted to spindle. Takes ¼" chip with .020" feed on cold rolled steel.



Model 1020S "Steelway"
PRECISION TOOLROOM LATHE

This lathe has the industry talking! Because of extreme precision, it has long been recognized as the top tool by master mechanics. Now, its adaptability and broad usefulness have highlighted its productivity. As one satisfied user states, "Our toolmakers go to a Rivett first in preference to our other lathes!"

RIVETT LATHE & GRINDER, INC.
Dept. AM-3, Brighton 35, Boston, Mass.

Go to Rivett now for information about this big, beautiful machine.
Send for bulletin 1020B.

RIVETT
"Steelway" Lathes

cepted academic subject would be even more suspect.

The matters about a plant that employees should know can be made clear enough in the shop newspaper to anyone interested enough to read the material. Furthermore the story will have better plant coverage, with a lower cost per employee. It is hoped that any information provided, from the educational standpoint, will increase employee productivity, even indirectly, but at least the information provided to the employee will not make necessary his absence from the job to absorb it.

I venture to predict that a school for novices (this discussion does not encompass employee job-training courses) would, if tried, ultimately fail due to a sense of its uselessness and also perhaps to insufficient patronage.

Edward Diskavich
Torrington, Conn

THERE IS NO question that it helps to have employees know about the product, and production problems, but the system Malone is trying to work out is not the answer. I don't know of any manager who would sanction the stopping of production to hold an hour's meeting to inform the rank and file about production problems; the cost would be high.

We had a similar problem in our plant, but we first approached our engineers for the solution. Out of approximately 50 engineers most were strong on design but weak on production. The tool engineers were not too bad, but could stand improving.

Approaching the problem from a different angle, it was decided to have a meeting for the methods men —assistant foremen, and setup men, split into two groups, meeting on alternate weeks. At the start a printed sheet was given to each one at the meeting outlining the purpose, and what we expected to accomplish. They were informed we wanted ideas, no matter how foolish they sounded, as the foolish ideas could be combined and possibly get one complete idea. As we were after ideas to cut costs and improve production, a number of parts we were having trouble with were on hand and passed among those present as it was felt having the part was better than a blueprint.

For the shop a different system was used. A board was set up in the cafeteria on which were mounted

NEWS ABOUT MACHINE MOUNTS

Unisorb offers three cost-saving benefits for installing machines and equipment . . . Legs or framework can be solidly secured to the floor without bolts or lag screws; No danger of machines "walking"; and Up to 85% of transmitted vibration is absorbed.

Precision machines need a special type Unisorb mounting. Centerless Grinder, left, was installed quickly, without bolts or lag screws; Milling machine, right, is mounted on Unisorb LEVEL-RITE MOUNTS for quick, precise level.

Every machine has a vibration "personality". Different machines require different densities. Only Unisorb provides the right density and thickness.

TRY UNISORB ON OUR TRIAL OFFER! Let us send you the right density and thickness for a specific machine. If you're not satisfied, return within 30 days and we'll cancel the invoice. Write or call, today.

UNISORB 200 SOUTH ST. BOSTON, MASS.

Division of The FELTERS Company

Want more information? Send for set of Unisorb "Facts" Books!

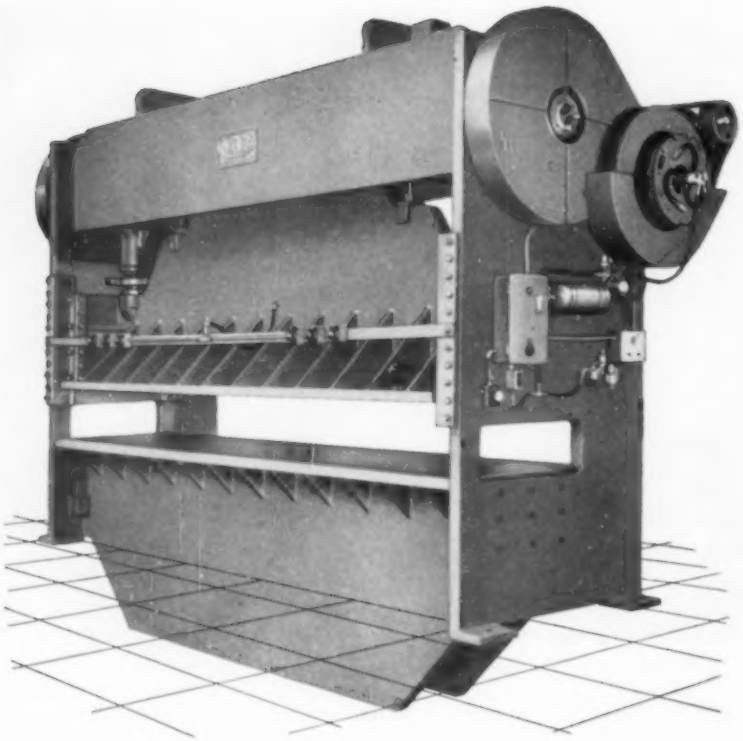
Please send me a set of Unisorb "Facts" Books and trial offer request.

Company.....

Name.....

Address.....

City.....Zone.....State.....



CHICAGO DREIS & KRUMP

PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

0874

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.
7434 South Loomis Boulevard, Chicago 36, Illinois

parts, along with a process sheet showing how it was being made. An employee may not have worked on that part in our plant, but from his previous experience may have worked on a similar part. By comparing the process sheet with his memory he can spot where we are wrong.

There are suggestion systems in plants, but from our experience most suggestions made are on parts on which the man has worked. Seldom are they concerning work on which the other man is working. By placing the parts on a board, with a process sheet and a note as to what our trouble is, they generally come up with an idea, or an idea that can be refined.

Ideas are paid for to all but the methods men. Parts which are costing too high, or have an excess amount of scrap, are suggested by the cost department, and are changed once a month and are rotated over a length of time.

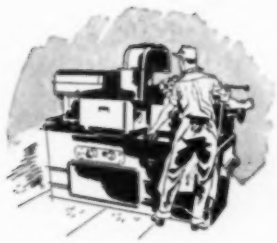
E C Porsberg
El Paso, Texas

THE SHOP is not an independent entity complete and sufficient unto itself. It cannot be operated according to the wishes and whims, the guesses and hunches of an impractical administrator who is devoid of technical training and mechanical know-how.

A commercial organization is faced with responsibility; responsibility to the purchasers who use the products and services, and to its employees and to the society of which it is a part. It is one link in a long chain and must conform to some sort of

(Continued on page 189)

"That's a new signal. What does it mean?"



"TRUKUT® increased production 4 times..."

A small Mid-Western machine shop was confronted with an economic problem – production costs were too high – tool life was too short. While engaged in the job of cutting threads on 1020 16-gage electric welded steel tubing, the shop called in Sinclair Representative Raymond F. Ohm for help.

Mr. Ohm reports: "Tool life was a maximum of only 100 pieces before burning took place. Thread was very rough, due partly to chatter because of thin wall of tube."

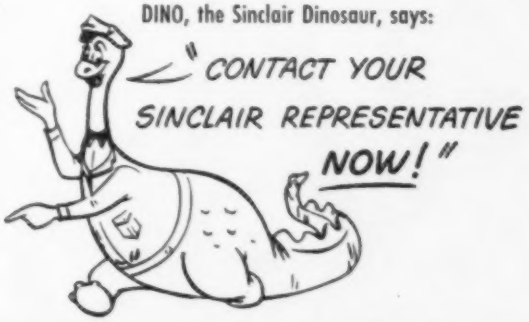
"I recommended Sinclair TRUKUT® EP Soluble Oil, Grade C, because it affords greater emulsion stability, longer tool life and better finishes with close tolerance. It also gives a greater cooling and load-carrying capacity to prevent tool welding and burning."

"With TRUKUT, *production has been increased four times.* Four hundred or more pieces are produced before tool is replaced. Also – finish of threads is finer, and general appearance of the finished piece is better."

"The shop found TRUKUT EP, Grade C, so satisfactory that it now uses TRUKUT exclusively."

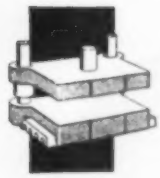
If *you* have a problem with cutting or grinding coolants, it will pay you to look into the advantages of Sinclair TRUKUT EP Soluble Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

DINO, the Sinclair Dinosaur, says:

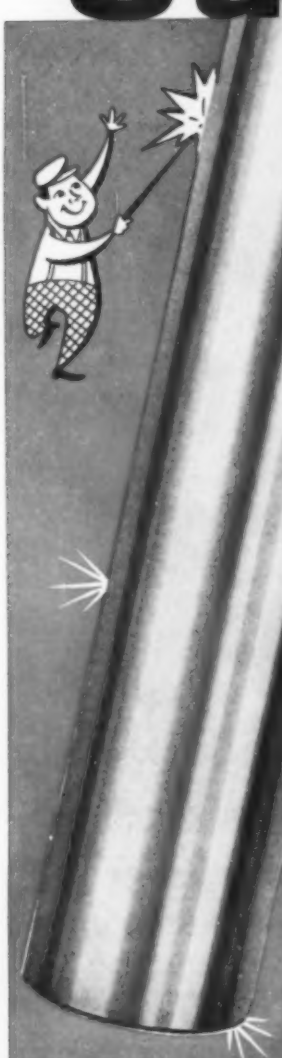


SINCLAIR

CUTTING OILS and COOLANTS



NOW all SUPERIOR die sets have Superfinish



GUIDE PINS

HIGH LUSTRE MICROFINISH (2-5 Micro Inches)

Results in

1. **Maximum Surface Hardness**
2. **Increased Bearing Surface**
3. **Longer Pin and Bushing Life**
4. **Greatly Reduces Possibility of Scoring**
5. **SMOOocother Action**

The process of Super Finishing removes the soft outer skin *(appx. .0002-.0003)* caused by the heat induced as a result of grinding.

Super Finish eliminates charging which is common to pins lapped with an abrasive compound.

Super Finishing, long a prerequisite in the Automotive and Aircraft Industry for precision bearing surfaces, is now a standard on Superior guide pins. With Super Finished guide pins ideal clearances can be maintained due to a greater bearing surface.

For Fast Local Service Call These Superior Representatives

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Dallas, Texas Riverside 6138
Winter Park, Fla. 4-0484
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Denver, Colo. Enterprise 234
Agawam, Mass. Republic 9-1132
Madison, N. J. Frontier 7-0307
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Racine, Wis. Melrose 3-1909

Plants at
Milwaukee, Wis. Mitchell 6-0057
Plainville, Conn. Sherwood 7-2701

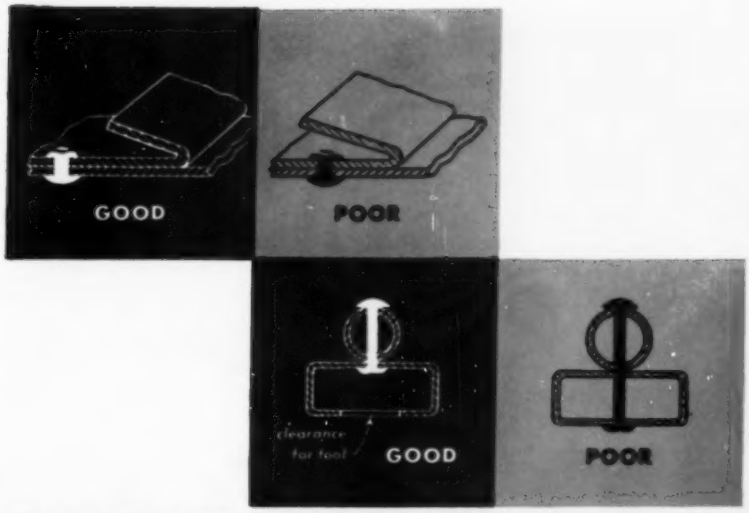
another die set advancement by **SUPERIOR STEEL PRODUCTS CORP.** 2754 S. 19th ST., MILWAUKEE, WIS.

standard of operation. This administrator is the boss and directs the activities of the men. It is their job to conduct themselves and perform their work in accordance with his wishes. Is it just and right to expect the men to conform when they know that there is a better way to do the job? Should they do the work in accordance with his wishes even if they are certain the approach is impractical and holds little promise of success? It is perfectly well and advisable to bring new ideas into the shop but an unskilled administrator is not the way to do it.

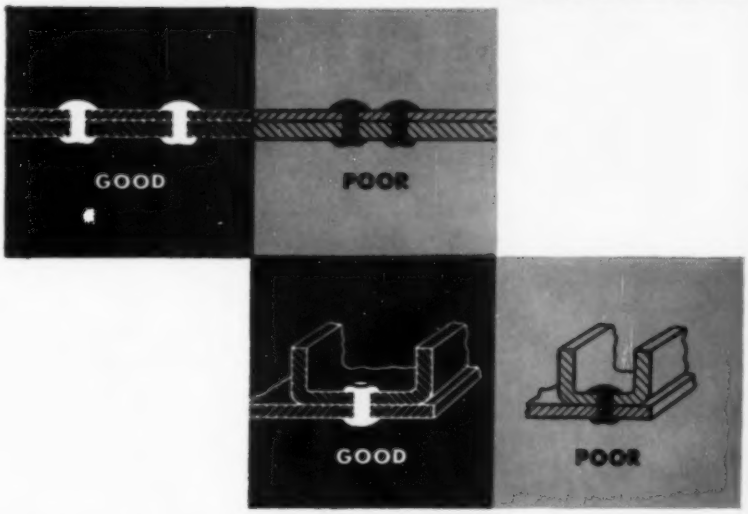
The man who assumes the position of foreman must have technical know-how and natural ability as a leader if he is to succeed. There are places in the business world where an un-initiated person can seek and successfully obtain a position he is not fully trained for. In some cases a man can combine the ability he does have with a lot of effort, and a little luck, and manage to hang on and learn as he goes along. This same procedure has been followed more than once in the shop but on the lower levels, not in the foreman's position. In the foreman's position the demands of the job are high, the responsibility is great and even a good man of experience and ability is frequently taxed to the limit of his capacity.

The organization that would succeed is the one with a good man, the best if possible, in each position. There are many companies continuing to operate in apparent disregard of this rule. Such organizations are not doing as well as they might and are surviving only be-

"A correction folks. It was Morton Johnson who won $75,000 on the sweepstakes—not Horton Thompson."



TIPS ON USING RIVETS



A short design course guaranteed to save a lot of grief—and money!

You could memorize these and thousands more design tips on the best use of rivets—but don't! Much simpler to call on Milford for the right answers to all your riveting design and application problems. Saves time and money, too. Full-tubular, semi-tubular, split, cutlery, decorative—Milford makes them all from any metal or alloy that can be cold-formed, then adds a wide variety of platings and finishes.

To improve product appearance and strength
. . . to take full advantage of automatic assembly
. . . to cut delivery time and production costs
—get in touch with Milford first!

THE MILFORD RIVET

MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
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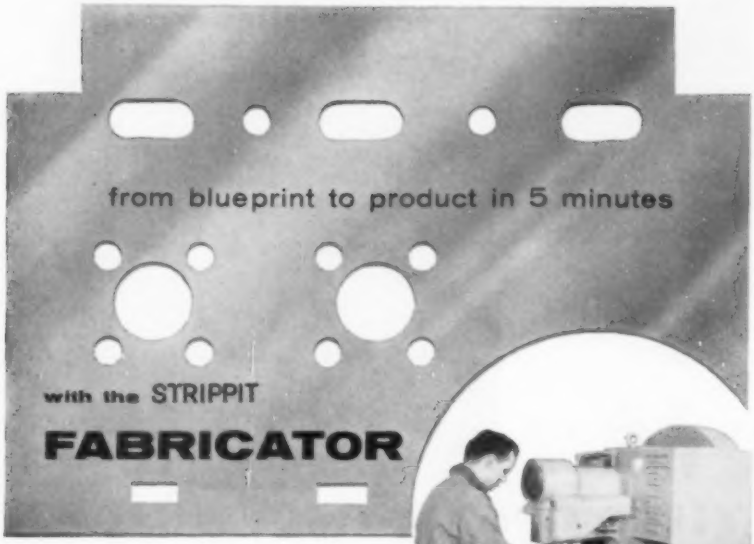
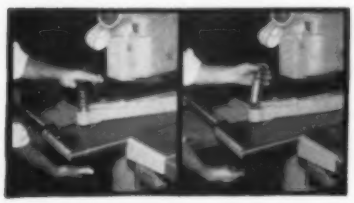


THE STRIPPIT FABRICATOR — a single compact multi-purpose Punch Press with quick-change tool holder, quick-set gauging and stops.

Short run? Complicated pattern? If it's sheet metal up to ¼" mild steel, if it's punching, notching or nibbling, it's profitable on a Strippit Fabricator!

Set up in minutes! Punches and dies are changed in 30 seconds or less, and Strippit guided punches need no aligning or adjusting. Back stop with precision gauge is instantly set by a locking knob. Self-tripping finger stops on gauge bars provide multiple stopping as the work is moved rapidly under the punch. A switch gives you single punching or 165-stroke-a-minute nibbling, and all tools are within quick reach in attached "file drawers" or shelves. The Fabricator is more than a one-machine shop — it's a whole system of quick-change, high-profit fabrication used by thousands of shops.

What's more, you can add the Strippit Positive Duplicator for high-speed punching in medium runs — plus the Dupl-O-Scope to punch Duplicator templates right from the drawing, in a few minutes. Write today for details and demonstration at your plant by the Strippit mobile unit. Warehouse stocks in Chicago and Los Angeles.



TOOL HOLDER is pulled out, for instant removal of die and punch assembly, ready for the next interchangeable tool. 1¼" diameter capacity holder shown, 3½" diameter holder also available.

A DIVISION OF HOUDAILLE INDUSTRIES, INC.

WALES STRIPPIT COMPANY

200 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Limited, Brampton, Ontario

cause of the extra effort of some of the men who are making up for the shortcomings of those who do not belong in the jobs that they have.

The foreman's job is an important one and the person who fills it should be selected with great care. Administrative ability is only half the story; he must know the work, the machines, and the materials.

Henry George
Bronx, NY

A SCHOOL for employees, prepared to give information and data on the variety of products manufactured and the description of the processes and methods used, is a sure way to obtain future foremen and executives. It gives those employees who are planning to stay with the company the opportunity to increase their knowledge, and it is this type of progressive employee who is of such great value to a company. If these talks also include short anecdotes about how certain employees saved the company from a serious loss by some quick thinking or by an ingenious and novel act (and also what the company did in appreciation of the fact), then this alone is a great help in improving morale and loyalty.

A description of the amount of thought and experiments that have to be put into what may seem like a very simple thing—such as, why does a modern automobile automatically straighten itself after turning a corner if the steering wheel is left free, or what takes care of the difference in revolutions of the two rear wheels when going around a curve, or how are gears designed so that there is no grinding contact between the

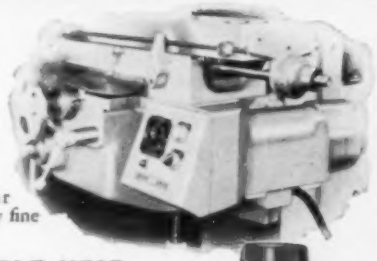
"What's this item in the plant paper referring to you as that Happy Carefree Bachelor. . ."

Eventually you'll buy a GORTON MASTERMIL

here's why

DYNA-DRIVE
"The Torque-Thinking" Table Feed

"Feels as it feeds"... automatically adjusts for exact amount of torque required. "Thinks while it works", compensates electronically for variations in density, hardness, molecular structure of materials. Result: Superbly fine finish, longer cutter life.



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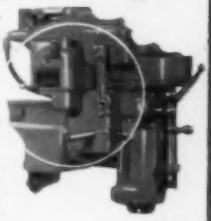
UNIVERSAL SPINDLE HEAD

2 HP dynamically balanced motor with belt and gear train provides wide range of speeds from 80 RPM to 5,600 RPM. Head swivels 90° left or right, head, ram and turret rotate 180°. Cross movement 14 inches. Push button starting.

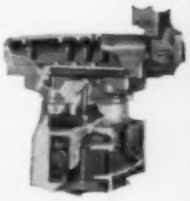
DOWN FEED INFINITELY VARIABLE

Feeds may be varied infinitely from 0" to 5" independent of spindle speeds. High efficiency belt drive. Direction and rate of feed separately controlled.



PERMANENT ACCURACY BUILT-IN

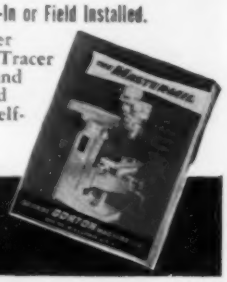
Distortion is prevented by extra heavy one-piece column cast with over-size ribbing . . . extra heavy alloy steel turret clamping bolt (1⅜" dia) with 3-point clamping action . . . heavy dovetail way full length of vertical column face . . . extra large table, knee and 24" saddle (2" longer than table travel) . . . square lock bearings with long, narrow guide between knee and saddle . . . positive locks . . . extra heavy feed screws . . . bearing surfaces hand-scraped.



Complete Versatility Through Attachments Built-In or Field Installed.

Among such equipment is, Trace-Master Hydraulic Tracer Control, Duplicator Tracer Head and/or Table with base, saddle and table in one unit, 6" Raising Block, End Measuring Rods and Dial Indicators, Self-Contained Coolant System.

Write for Bulletin 1503



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GEORGE *GORTON* MACHINE CO.

1503 RACINE STREET, RACINE, WISCONSIN

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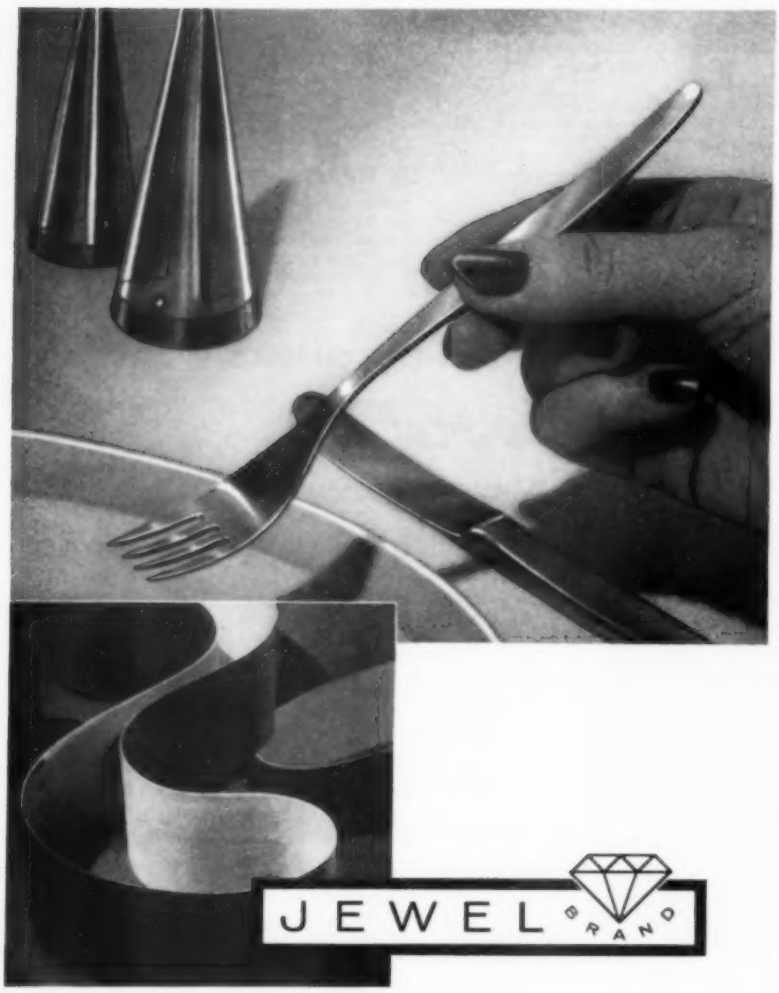
Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A8-1008

For the finishing touch that means so much!

From the smooth feel of perfectly polished stainless steel tableware to the contoured grips on modern power tools, Jewel Brand Coated Abrasives are bringing fast, efficient grinding, smoothing and polishing to the manufacture of hundreds of products. Because *end products cost less when you finish with Jewel Brand Abrasives,* it will pay you to bring their many advantages to bear on your finishing problems. Order now from your Industrial Distributor or write for specific recommendations.



COATED ABRASIVES

Belts • Rolls • Sheets • Discs • Specialties

ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

teeth when revolving, and why cannot steel bearings be used for steel shafts, even if they are lubricated—all this is of great interest to the deeper thinking men and naturally they are the ones who make the best foremen, superintendents, and managers. Their interest and questions mark them as progressive against those who just look, listen, and probably say, "Is that so. . . ."

It is also a wise personnel manager who attends these meetings and notes what questions the various students ask, and how they act, and it should be noted that it is the firm which picks the best man for each job that gets the best orders and gives the best satisfaction. And remember, it is the man who best knows the details and methods of his company who is most likely to be tapped on the shoulder when a better job comes up.

There is the case of Old Bill, the foreman in the tanning department, who always mixed the vat solution for a special process by himself. After years of service he suffered a stroke one afternoon and was taken to the hospital in an incoherent condition. The next day the superintendent took over and went through the files but was unable to find the one containing the proportions for mixing the proper tanning vat solution. He called the men in the tannery together and asked if there was anyone there who knew how to run the quick-tanning process. One man stood up and said he was an old

"Quick, give me the front office. . . . They just hired me a man who reads a micrometer with, "It's 5 and a long line, a little line and three itty bitty marks!"

UNVEIL NEW IMPROVED VERSION OF FAMOUS IRON POWDER, LOW HYDROGEN ELECTRODE

MAC: What's so special about the new SW-47? I always thought it was pretty good as it was.

SMITTY: Well, it says they did some changing on the chemistry to make it even easier to use in down-hand and out-of-position work.

MAC: Is that all?

SMITTY: Nope, listen to this . . . *compared to other rods of the same type, the SW-47 digs deeper and with a better crater. On vertical up welds the slag washes out of the corner better and arc direction is maintained with much less crater flaking.*

MAC: Sounds like we better pass the word on and get a trial order in?

SMITTY: You bet! And the white shirt boys will be happier to try it when they know A. O. Smith lowered the price too!

MAC: Come to think of it, we better get up and see 'em right now 'cause that man from A. O. Smith comes 'round just about as often as the Sputnik!

Through research A.O. Smith *. . . a better way*

A.O.Smith

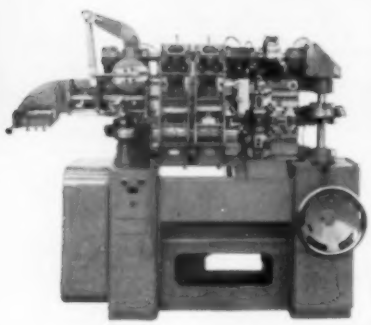
CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

A. O. Smith International S. A., Milwaukee 1, Wisconsin, U. S. A.

THE FIRST ENTIRELY NEW FOUR-SLIDE IN FIFTY YEARS!



A development of industry-wide importance is the Torrington Verti-Slide—a new vertical 4-slide that is the first major innovation in the basic field of wire and strip forming equipment in half a century!

The Verti-Slide was designed to meet a serious need for greater versatility, lower tooling cost, faster set-up time and reduced floor space. We urge you to investigate the new Torrington Verti-Slide in detail.

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO

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tanner and knew the business, so he was put in charge and it took him only a week to prove that he knew nothing about the process and got himself fired for lying.

The superintendent now was plenty worried for the time was approaching when promised goods had to be shipped—and the leather was not even tanned. Then a young man named Rodger, who was simply a helper around the tannery, came to the office and nervously said that if the superintendent wanted to know how to mix the batches the young man knew exactly what should be used and how much.

"How do you know about the proportions?" snapped the superintendent.

"I helped Old Bill mix the batches," explained Rodger.

"Did you weigh the stuff?"

"No. Bill always did his own weighing, but I helped and I noted how much of each material he used and I wrote it all down when Old Bill had gone."

"You spying on us?"

"No, sir! I just wanted to learn the tanning business, and everything I see or hear about it I write down and file for reference. I hope to be a competent foreman some day."

"But why didn't you come forward before and tell me this?"

"I am only a helper, sir, and I was afraid you would laugh at me."

"Listen, Rodger; if you are that thorough and careful, I believe you are the man I'm looking for and I'm going to give you a chance. Come with me to the tannery and we'll mix up some batches. I'm making you acting foreman—think the men will follow your orders?"

"Oh yes, sir. They are all very nice to me and they had their chance, so they cannot complain about me."

"Is that why you kept quiet when

"Down a little! Ah—that's it!"

Bath "whips" another threading problem!

Difficult quintuple Acme thread completed with 4 taps.

Unusual specifications for this aviation component part presented a challenge to experienced Bath engineers—who successfully designed a close tolerance set of 4 quintuple thread 1/6 pitch, 5/6 lead taps—each with 4 flutes and 5 leads.

These ground from the solid Bath taps are 3/4 — 6 — National Acme, Class 3 Centralizing, left hand . . . and required three especially designed Bath gages for inspection control.

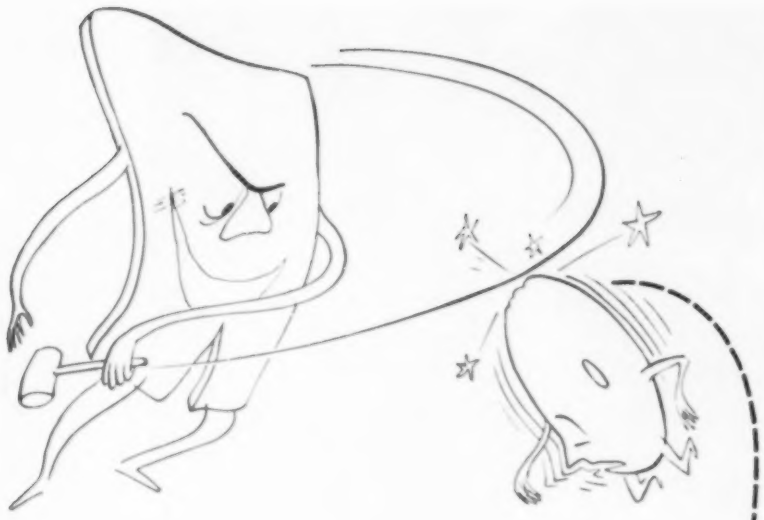
Here's another example of the type of cooperation you may expect from Bath representatives and craftsmen when you have a threading problem. Why not tell us your tapping and gaging troubles!

Inspection requires three Bath gages. One "go" gage (shown in the piece) checks the major and pitch diameters. One "not go" gage checks the major diameter and another "not go" gage checks the pitch diameter.

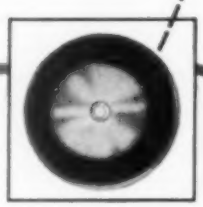
for the best buy ...buy Bath

JOHN BATH & CO., Inc.
22 Mann St., Worcester, Mass.

CYLINDRICAL AND THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS



No matter how they sliced it, RUBBER dulled their SKIVING KNIVES



The skiving knives used by a rubber processor had a short service life because rubber is highly abrasive. By Flame-Plating the knives on one side with tungsten carbide, their service life was increased 15-fold.

Flame-Plating is LINDE's special process for coating metals with a very hard and durable surface. By this method, tiny particles of tungsten carbide or aluminum oxide are literally *blasted* onto almost any metal surface. Most important, the temperature of the part seldom exceeds 400-degrees F., so there is little or no chance of changes in the shape or metallurgical properties of the part being coated. Flame-Plated coatings can be applied from .010 to .002 inches thick, and finished to 0.5 microinches rms.

The machinery and equipment you use may have its service life greatly extended at critical points of wear by Flame-Plating. For more information, write for a free copy of the booklet, "Flame-Plating," F8065. Address Flame-Plating Dept., LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

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I asked for someone to run the tannery?"

"Yes, sir."

"You're more than smart, son—you may prove to be a wizard," admitted the superintendent.

Today, Rodger—that is not his real name—is not only manager of that tannery but is also part-owner.

George P Pearce
Albuquerque, NM

THE BASIC engineering course is a good idea. It is a good plan because it soon becomes apparent who are interested and also shows up those who are loafers. Sure, some of the lazier employees will get some sleep on company time, but there are others who will learn many things to help them in their work.

Employees want to learn something about the company they work for. They are interested in other operations related to their own, as well as company plans. Most of all they learn something about management problems. You can lose your money, home, or even a loved one, but not something memorized in the head.

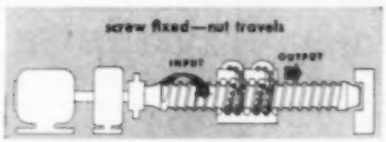
As a result of these meetings the employees learn to temper their judgment on many phases of management. They learn that there are good days and bad, victory or defeat, give and take. They learn that you become unpopular if you gossip, and that buck-passing sometimes backfires. The employees learn that the boss is not always a big bum

"Bilgo is here to report on the success of the latest new process."

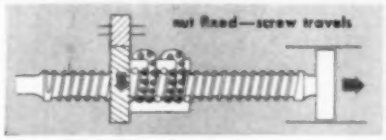
Here's your new ANSWER

PHOTOGRAPHED ACTUAL SIZE
BALL CIRCLE DIAMETER: 3/16 inch.

WORLD'S SMALLEST ball/bearing SCREW SOLVES CRITICAL MINIATURE POSITIONING/CONTROL PROBLEMS



NUT TRAVELS: When rotary motion is applied to the screw, the b/b nut glides along the axis of the screw on rolling steel balls, converting rotary force and motion to linear force and motion with 4/5 less torque than acme screws.



SCREW TRAVELS: When rotary motion is applied to the b/b nut, the screw glides along its longitudinal axis on rolling steel balls, converting rotary force and motion to linear force and motion with unprecedented efficiency.

An unprecedented achievement in minimum size and weight—maximum efficiency, dependability and service life for ultra-precise controls.

It's another first from Saginaw—and the possibilities it opens up for improved electrical and electronic controls are limited only by your imagination! Radar tuners, missile and rocket guidance and telemetering systems, automatic switchgear, electronic machinery controls are just a few of the applications where this new miniature Saginaw b/b Screw will solve critical positioning/control problems. *It's so compact and light,* you can save substantially on space and weight. *It's so efficient,* (over 90%) you can use much smaller motors and gear boxes. *It's so precise,* you can position components within .0005 inch per inch of travel. *It's so dependable,* you can rely on remarkably long service life even in adverse environments.

You will find our 1958 Engineering Data Book extremely helpful in planning applications, or experienced Saginaw engineers will gladly make specific recommendations without obligation. Just phone, write or mail the handy coupon.

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*Patents Pending

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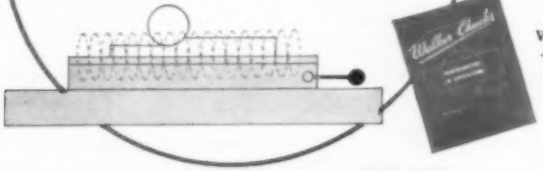
Walker permanent chucks have exclusive construction with magnets polarized *horizontally*. Cutter is constantly *demagnetized* as it progresses, with *no fouling* of cutter, work and chips!



Write for new Catalog 58 — it gives complete details on the Walker line of permanent, electro and vacuum chucks.

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and that getting along depends 95% on their own behavior.

A E Salmons
Norristown, Penna

LET THE KID CLEAN UP

Should skilled mechanics and tool and diemakers be relieved of the chore of cleaning up chips and dirt? Should apprentices be expected to do any part of clean-up jobs?

I think it's a good idea, as practiced by many shops, for the operator to clean up around his machine and at the end of the week to place whatever is collected in a pile in an aisle to be taken up by the sweepers assigned to the job. The operator should be required to keep his machine cleaned sufficiently to work properly at all times. Operators are traditionally responsible for cleaning machines and small tools, and should be given a specified time each week in which to do it.

In the final analysis, anybody can sweep a floor and clean up chips and dirt, but not everyone can work a precision lathe or jig borer. Such skill is expensive in terms of wages and productive time, and should not be dissipated in trivial duties like broom-pushing. Let the hired sweeper clean up.

The apprentice is an investment in the plant's future. The apprentice-training program costs both the company and apprentice something—management in the form of actual cash outlay, and the apprentice many sacrifices, financial and otherwise. It

"Sure, the pay is good, the hours are fine and my co-workers are nice. It's just that I hate work!"

Seeking an answer to the squeeze on profits?

The economic outlook makes searching re-appraisal of production techniques a must these days. For in the ever-shrinking gap between selling price and cost lies the future and vitality of every business.

While the answer to cost reduction in any particular company is never simple, let's examine, for a moment, the relatively narrow problem of stamped parts production, a factor in many metalworking businesses. While the use of stampings, rather than machined or cast parts, means economy in itself, there is still a vast potential for savings in their production.

We at Wean have a unique product to sell for the production of stamped parts. It is called the "Flying Press," a name that has been adopted to describe the unusual motion of this press. We call it unique because the "Flying Press" produces stamped and formed metal parts at a rate (and low cost) hitherto unheard of in the industry: all due to its revolutionary design which eliminates clutch, brake and flywheel.

As you might presume, the "Flying Press" costs more initially than ordinary presses of the same tonnage. It costs more because it offers far greater production, versatility, and operating economies . . . and costs more to build. (We're in the same position you are, after all.) But even with this higher equipment cost to be amortized against production, the "Flying Press" produces stamped parts in the most economical way yet devised. Certainly, if you use stampings extensively in your production process, you should know more about this unusual piece of equipment.

We'd like to send you a brochure that describes the "Flying Press" and its advantages. Then, if you are interested in how it can apply to your specific production processes, we'll be glad to explore the matter further with you. We can even run your dies on a demonstration machine at our Cleveland plant. Please let us hear from you.

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Bearings are protected at Sikorsky by first dipping them in Tectyl compound #867 (film-thickness .0002 in.) to remove finger prints. Acid content of a smudge can cause corrosion. A second operation applies Tectyl #437 (film-thickness .0015 in.) preserving the surface indefinitely prior to installation. An additional Valvoline Tectyl product #506 (film-thickness 0.004 in.) a solvent cut-back compound, is sprayed on production jigs and fixtures before storage.

Why Tectyl Is Used . . Metal acid salts react with moisture to form corrosion. Deterioration of metal can be prevented by dipping or spraying the surface with protective petroleum-base chemical coatings. Valvoline produces a broad line of wafer-thin coatings for every type of rust-preventive need. Insure high dollar parts and equipment investments with TECTYL Compounds. Write Tectyl Division, Valvoline Oil Company TODAY!

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Valvoline Oil Company • FREEDOM, PENNSYLVANIA

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would be unwise and unsound management policy to allow any deviation from training to sidetrack the apprentice to clean-up chores when he should be devoting his full time in acquiring the maximum possible skill in his allotted training time.

Harry Kaufman
Philadelphia, Penna

THE SKILLED mechanic should certainly be relieved of such things as cleaning up a machine after he has finished with his job. It is the duty of the well-trained mechanic to be creative and what in hell is there creative in brushing off a lathe or milling machine? It is nothing short of asinine to have an experienced mechanic doing work which is discouraging and which can be done by cheaper labor. Oh, there may be a time or two when it is necessary for one to cooperate with his fellow workers and do a little swishing and wiping here and there, but it is idiotic to make it a regular practice.

A skilled tool and diemaker is one of the most valuable elements in a manufacturing unit and it behooves the employer to take advantage of his wisdom and experience. Everything should be done to keep his morale at its highest peak in order that his thinking mechanism can work effectively. The poor sucker may jump in at home and help the little woman out by washing up a few dishes now and then, but on his regular job he should be treated like a king and relieved of every detail which does not contribute to his highest effort. Everything possible should be done to give him peace of mind in order that difficult problems may be met with in victorious fashion.

Machinery will get cluttered up

"Personnel? . . . About that casting expert you sent me. . . ."

with chips throughout the day and the situation must be rectified in order to maintain an effective working atmosphere. Either a janitor or one of the boys learning the business should be called upon to do this kind of work. The only difficulty in calling on the janitor is that he has a regular schedule to meet and the time lost in trying to contact him will offset the advantages of relieving the skilled man. Our only solution, it seems, is to call upon the apprentice to do the job.

A certain amount of cleaning up should be a part of the new boy's training; not that he will acquire any knowledge or skill pertaining to the business, but there is an element of habit-forming tidiness in his workmanship inculcated in cleaning up. His loss of time is greatly offset by the experienced man's gain in being able to do more worthy work.

To some of the wise-crackers just out of high school this may be a revolting task. I say, let the kid get his bumps right at the start of his learning session. The youngster who thinks he is too good to do such menial tasks should have his bottom waxed and sent down the chute. The employer is going to lose money on the apprentice anyway until he can be useful enough to earn his salt and, until then, he should do what he can to make up the deficiency by helping out the skilled worker.

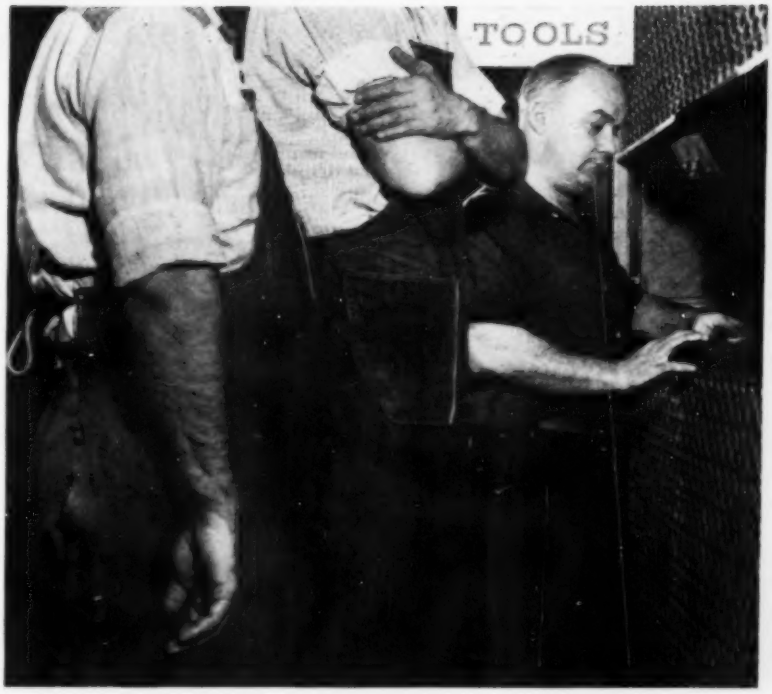
John Homewood
Laguna Beach, Calif

HOLD BACK THE PAY

Can a company legitimately hold back a man's first week's pay as a form of security for both parties? Even if it is restored when a man leaves, will it cause resentment and misunderstanding among the workers?

IMAGINE, IF YOU CAN, a business man proposing to his backers the possibility of starting a bank which would keep the public's money without giving them any compensation in return. Such an optimist would be laughed off Wall Street. Yet it is just this kind of an idea that a company follows when it takes a week's pay from one of its new members and keeps it for an undetermined amount of time, neglecting to pay even the minimum interest rate.

Usury is a term that refers to the lending out of money with an excessive interest charge for its use. The taking of money, even for a



Now! Stop Costly Waiting at Tool Crib with McCaskey Tool Control System!

Now . . . newly developed procedures in McCaskey's famous Tool Crib System . . . completely eliminate time lost by highly paid machine operators drawing and returning tools. Crib attendants prepare kits of tools for jobs or operations in advance. Machine operators simply pick them up or they may be delivered to their machines.

Newly designed tool orders are quickly written by crib personnel, by operators at machines or crib or both. Result: No wasted time at tool crib . . . more working time at machines . . . increased machine productivity.

The McCaskey System reduces tool purchases by cutting crib inventories. Reduces tool breakage, loss and theft. Cuts cost so many ways it pays for itself in a few months.

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You get still more opportunities for cost reduction with Hanson-Whitney developments, such as the new Hi-Spi 52 tap. This unique 52° spiral flute tap solves chip removal problems . . . taps titanium, stainless and other hard steels.

Call your Hanson-Whitney field specialists for practical, **one source** solutions to *all* your threading problems. And you can count on H-W Distributors across the country for fast service from complete stocks.

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temporary time, without recompense can be called injustice.

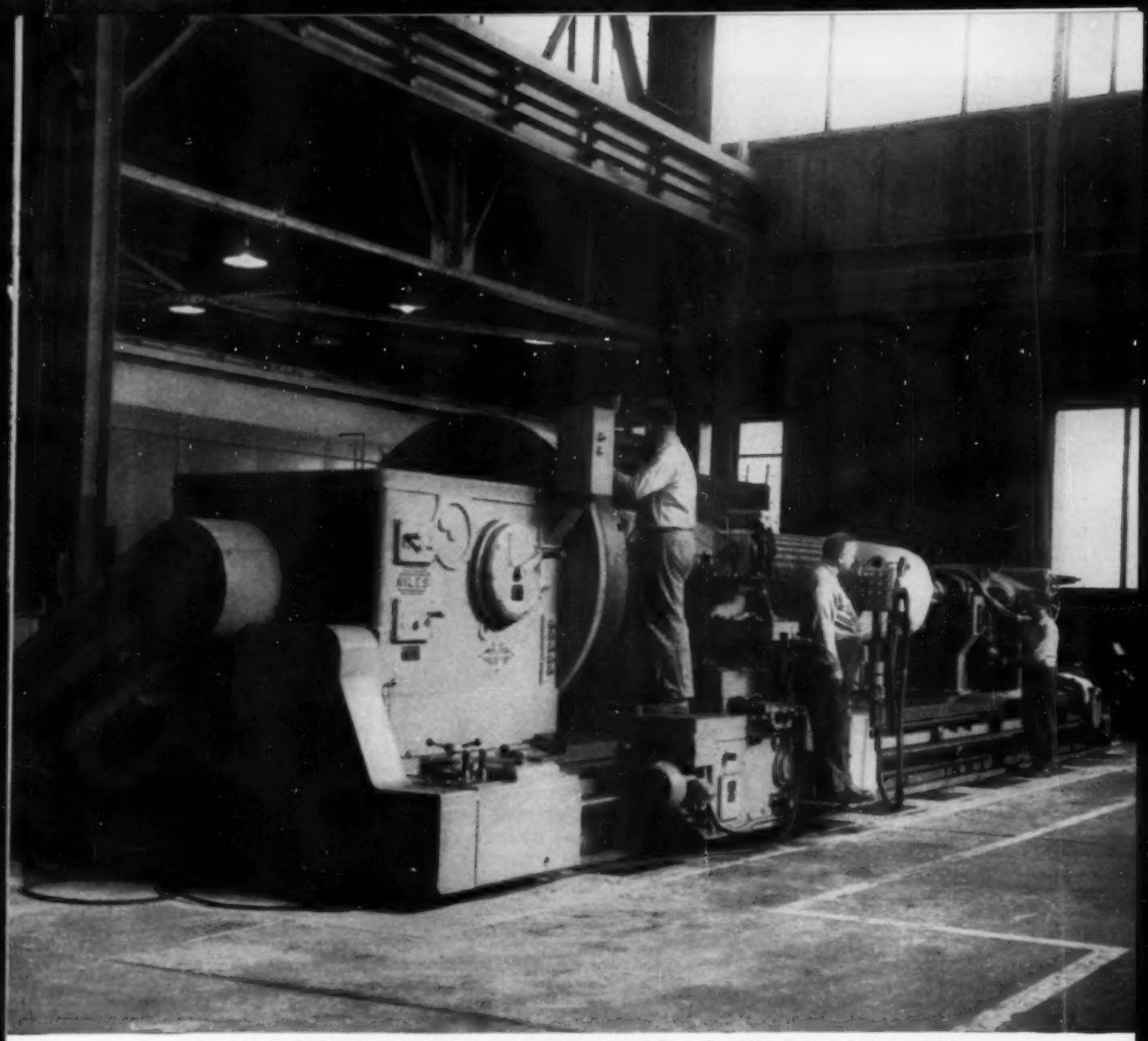
Surely it's nice to know that you have an extra week's salary tucked away when you must leave a job, but the boss's holding it for you is a far cry from a bank's keeping it in its possession. Before proceeding further one should keep in mind the fact that if a man's pay check is deposited in a bank it is insured by the Federal Reserve, whereas if it is placed in the company treasurer's vault, who can be sure of the outcome?

If an organization's turnover is heavy then one should hesitate to consider starting a job there but if the majority of workers stay till retirement then the loss is considerable if an outfit follows the "hold back" policy. Few banking establishments pay less than 3% and recently many of them have upped their interest payments to 4% on a dollar. At that rate a man with a starting salary of $90 a week would lose between $2.70 and $3.60 a year or between $54 and $108 over a 20 or 30-year period. These figures are arrived at by merely calculating the simple interest. If we stop to figure out the compound interest, or the money paid on unpaid interest besides the original capital, the debt would be even higher. Indeed we could go a step further and say that the money might have been safely invested in a blue chip stock at a 6% minimum gain.

From management's point of view, when these profits of $54 to $108 a year or more are multiplied by the number of workers in an establishment, we see that a handsome sum

(Continued on page 205)

"I suppose that means I've got to do it over."



This new 72 in. x 38 ft. Niles lathe recently installed at the Consolidated Edison Co. of New York repair shop at Astoria can handle all the rotary fields and three-fourths of the high-speed turbine spindles in the company's network of generating plants.

Con Edison to save thousands yearly with new Niles Lathe

The installation of a Niles 72 in. lathe in the Astoria repair shop of Consolidated Edison Company is expected to save thousands of dollars in the course of a year by reducing total downtime from months to a mere few weeks.

This new lathe will eliminate the necessity of sending generator parts back to original manufacturers or to other outside machine shops for maintenance and repair. This fine Hamilton-built machine tool was custom-designed to meet Con Edison specifications.

Please address inquiries to Dept. 8C

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New CFC Honan-Crane Hydraulic Filter Meets JIC Specifications

Now, in this compact K-Type Filter, you are assured of continuous micro-clarity of all hydraulic fluids — for abrasive contaminants only, or for both solid and dissolved impurities. It's easy and economical to keep hydraulic fluids clean — avoid downtime, prevent excessive wear, safeguard against clogged valves and pistons.

NEW FLO-PAC

Filters Out 98% of All Particles Over 5 Micron.

The new FLO-PAC 5 Cartridge is designed to remove 98% of all particles larger than 5 microns. Tough, resin-impregnated pleated paper provides more than 6300 square inches of filtering surface. Paper is inert — will not remove additives. FLO-PAC 5 is especially designed for high flow-rates; for either full-flow or by-pass filtration; and for water-base hydraulic fluids.

"T" TYPE CRANITE

for Solid Particles and Products of Oxidation

The new K-Type Cartridge was developed specifically to best meet JIC hydraulic standards. It contains 13 pounds of Type "T" Cranite (fuller's earth) enclosed in a metal container. It removes water, acids, tars, and asphaltines as well as solid contaminants. Processed at extremely high temperatures, Type "T" Cranite is especially resistant to water. Cranite is packed so solidly that it cannot settle, thereby preventing by-passing. This new K-Type Cartridge is interchangeable in many makes of filters which meet JIC Specifications.

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is at stake. Who reaps the profits? That depends on whether or not a new worker has enough gumption to stick up for his right to his first week's salary as soon as he's earned it.

Joseph McLaughlin
Rockaway Beach, NY

WHEN two people make a bargain and are willing to stick to it, why say more? Why, because people have a habit of minding other people's business. Ed and Al must either be happy in their assignments at the shop or unhappy with what they are doing.

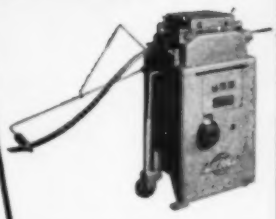
If they are dissatisfied, their first concern should be in clearing up their own problems, not anticipated ones of men who are not even a part of the shop yet. After all, Al and Ed are not being affected in any direct manner. As the men in the bible story who worked in the vineyard, they should be satisfied with what they agreed upon when they first accepted their jobs.

If, on the other hand, Ed and Al like their work and have no complaints other than the one they are discussing, they should feel confident that a company that provides its men with such satisfactory working conditions would hardly play unfair with new recruits.

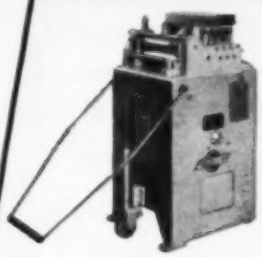
Even if it does seem taxing to hold back a week's pay, consider for a moment the reasoning from the company's point of view. Aside from the arguments that are being proferred by Ed and Al, in a large industrial organization there is a great deal of bookkeeping required in a treasurer's office before a salary payment is made.

Attendance reports must go through several channels before they reach their final destination. These

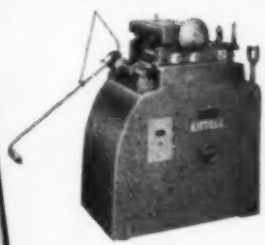
LITTELL STRAIGHTENERS



No. 208 STRAIGHTENER
For stock .010" to .040" thick and up to 8" wide. Also straightens stamped parts.



No. 308 STRAIGHTENER
For stock .018" to .065" thick and .018" to .050" thick, up to 12" wide.



No. 412-3PD STRAIGHTENER
For heavier stock from .040" to .125" thick by 12" wide.

FOR
AUTOMATED
COIL STOCK STRAIGHTENING AT ANY SPEED YOUR PRESS REQUIRES

STANDARD LITTELL STRAIGHTENERS with Variable Speed Drive straighten stock at any speed from 10 to 60 feet per minute. Proper slack in straightened stock between straightener rolls and press is automatically maintained by the Arm Control's up and down action which starts and stops the straightener motor.

ELECTRIC CLUTCH and BRAKE LITTELL STRAIGHTENERS provide for high speed intermittent straightening action with no motor stop. Ideal for hump feeding.

OIL GEAR DRIVE LITTELL STRAIGHTENERS have a straightening speed range of 0 to 60 feet per minute. Ideal for intermittent feeding of long stock lengths.

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from complete stocks in the newly enlarged Littell plant.

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says Factory Superintendent Dan Thomas*

Our production figures ran all over the chart when we were using stock-feeding devices equipped with feed-fingers. In addition to tricky set-ups and frequent re-sets, we lost a lot of polished stock which had to be scrapped or refinished when scratched or marred by feed-fingers. Operators suffered fatigue and strain trying to stay on top of these mechanical "prima donnas." Production suffered from the slow-downs resulting from all these factors.

Our first test run of a Lipe A.M.L. Bar Feed proved that every one of these "bugs" could be eliminated—permanently. It fed stock continuously . . . without feed-fingers . . . with no repeat motion for feed-outs . . . no down-time for adjustments or remnant removal. There was no cutting air: From 7:30 to 4:00 every turn of the spindles produced *work* . . . at a day-in-day-out delivery of 58% higher production! Our entire department is now equipped with Lipe A.M.L. Bar Feeds.

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*Photographer's models and pseudonyms used to protect company identity and confidential information.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N.Y.

BAR FEEDS • HEAVY-DUTY AUTOMOTIVE CLUTCHES • PORTABLE POWER HACK SAWS

reports must be recorded and absenteeisms deducted in turn. This takes time. Excused absences receive different treatment. This takes more time. Raises and bonuses further complicate the picture. Overtime is added to the stew plus occasional extra outlays for transportation or other incidentals charged to the company. All of these things are a part of the picture that precedes the moment when the teller presents the employee with his take-home money.

Is it demanding too much then to ask for a few days' delay between the time that a man puts in his last hour in the week, or is absent from same, and the time that he receives compensation for his labor? It hardly seems unreasonable to ask a worker to wait for a relatively short interval of time while his check is being determined. After all, we sometimes wait months for a refund from the United States Treasury Department. We should be able to sit tight for seven days when we are dealing with private industry.

Neal A Mack
Belle Harbor, NY

SCHOOL FOR NOVICES

Would a basic course in facts about the plant, the product made, and facilities for making it be of interest and value to the workers in the shop, or are shopmen generally disinterested in such information?

THERE IS MERIT in the idea of a "school for novices." It is in line with the "new look" industry is giving to its training programs. Technological progress has created new and highly complex skilled crafts, and added so many new skills to old crafts as to alter them greatly. Closer tolerances, finer finishes, more intricate design, more complex wiring and the use of finer equipment and materials have placed a premium on the thorough training of today's skilled worker. The school for novices offers a good indoctrination for the worker who participates in a formal training program by familiarizing him with the functions of the plant's departments and the products being manufactured.

For the man who has been working at a trade for any length of time, it may be difficult to attract his participation in the plant school. It is advisable to make the classes optional, with perhaps the first two or three attendances compulsory, so that the type of material would be

(Continued on page 210)

Gregory Grant says . . .

"WHY ALTER A STOCK GEAR?"

- Grant can manufacture gears in production lots to your specifications at less cost than you can purchase stock gears and alter them to your requirements.
- If you rebore a stock gear, you lose gear accuracy lower gear efficiency and shorten gear life.
- When you alter a stock gear in any way, it costs you men, money, and machinery that can be released for your own production.
- Send us your specifications and Grant can furnish gears with the hole size, slot for the key way, and tap for the set screw exactly as you require them. In other words, Grant can deliver gears ready for installation.
- Grant Precision gears can be supplied in precision class 1 or class 2 in any material.

SPUR GEARS

Available from .125" P.D. minimum, to 40" P.D. maximum — hobbed or shaped in a selection of 120 D.P. to 2½ D.P.

BEVEL AND MITER GEARS

Available from .375" D.P. minimum, to 24" P.D. maximum depending on ratio— with a selection of 64 D.P. to 2½ D.P.

WORMS AND WORM GEARS

Available from .500 P.D. to minimum, 35" P.D. maximum — hobbed in a selection of 64 D.P. to 2½ D.P.

HELICAL GEARS

Available from .250 P.D. minimum to 35" P.D. maximum — with a selection of 64 D.P to 2½ D.P.

FEED SCREWS

Available from .250" P.D. minimum, to 9⅞" O.D. maximum — in lengths up to 36' depending on diameter, with choice of 96 D.P. to 2 D.P.

GROUND THREAD CAPACITY

Available in range ⅛" P.D. to 6" P.D. 12" face maximum ground from 120 D.P. to 4 D.P. with pressure angles of 14½°, 20°, 22½°, 25°, or 30°.

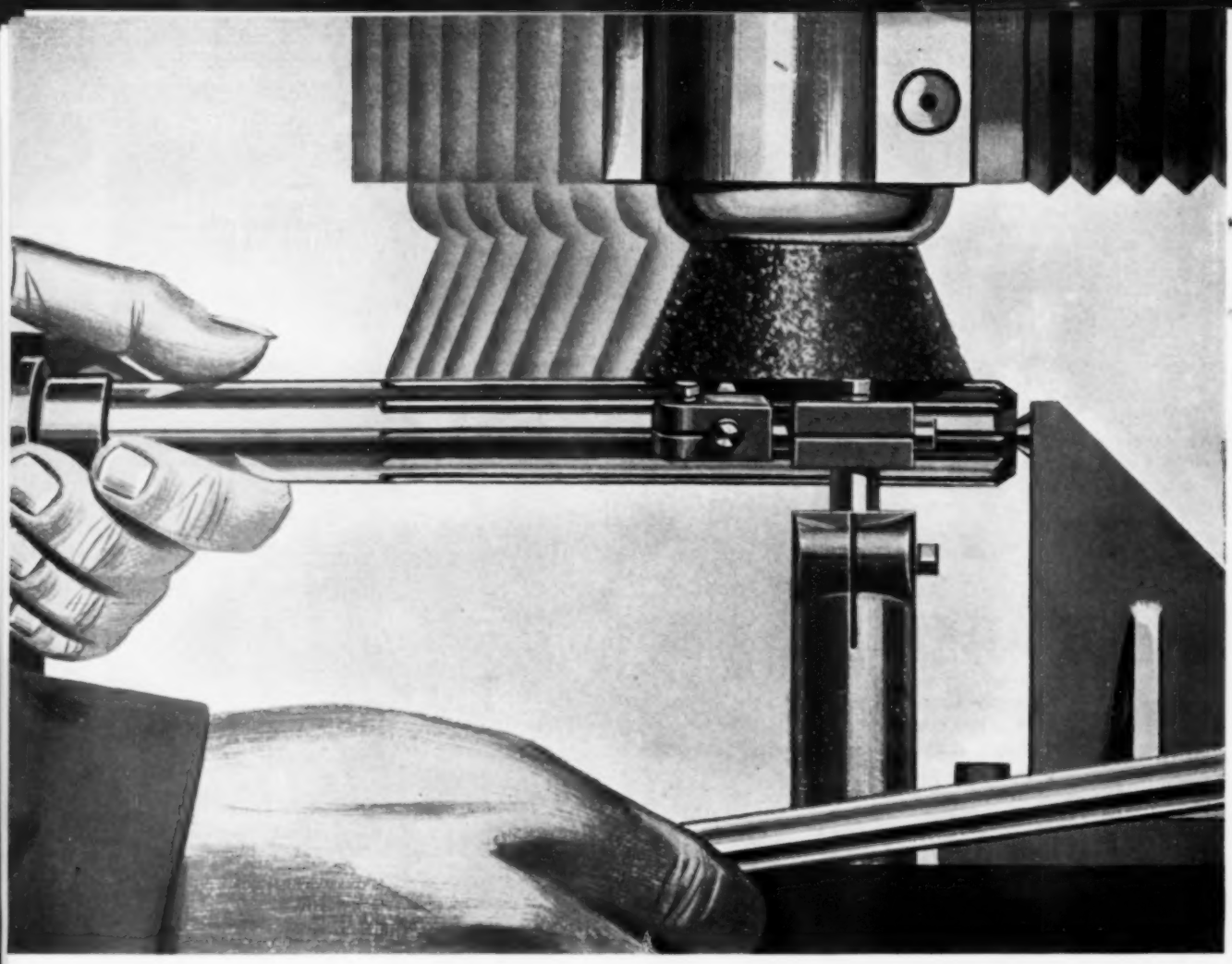
Delivery on any quantity of precision or custom gears can be arranged to meet your production schedules. Whatever the quantity, you'll find that each gear has a uniform accuracy that insures maximum dependability and eliminates rejects.

ESTABLISHED IN 1877

GRANT GEAR WORKS, INC.

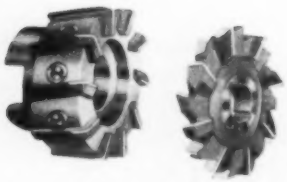
WEST SECOND STREET, BOSTON 27, MASS.

• CATALOG AVAILABLE ON SPEED REDUCERS • COMMERCIAL GEARS • PRECISION GEARS



Oliver "ACE" Tool and Cutter Grinder

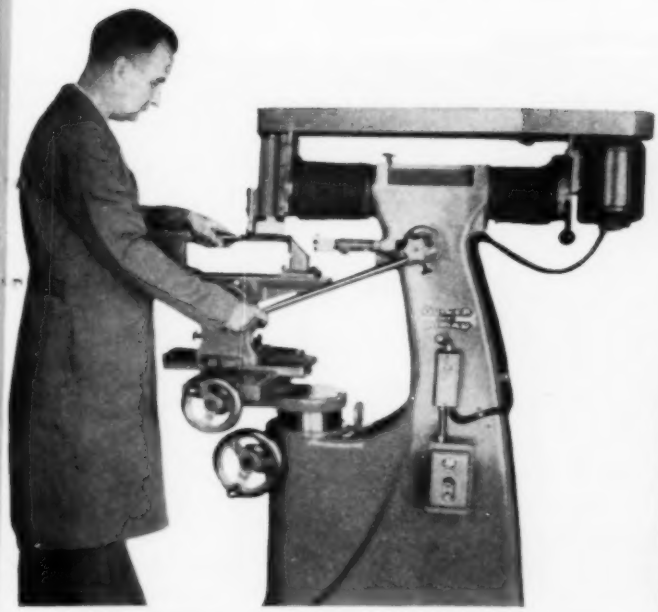
WHEEL TRAVERSES . . . *not the work!*



Face mills, reamers, hobs, spot facers—all cutters straight or spiral —are quickly, easily and economically sharpened with the Oliver "Ace."

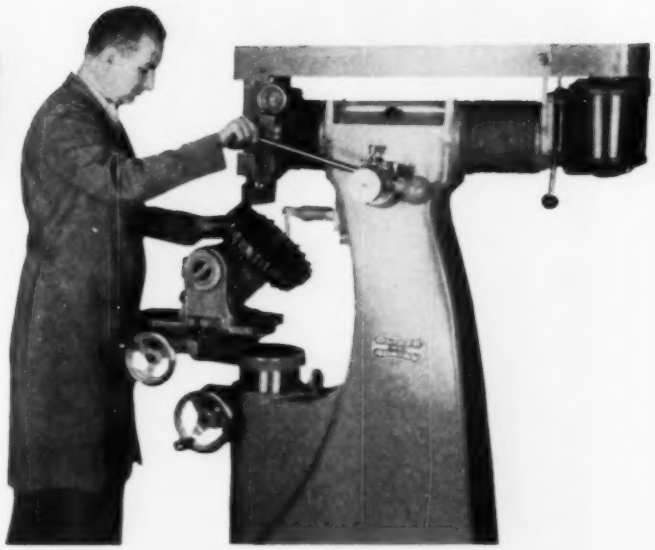
You can grind tools and cutters more accurately with the Oliver "ACE" because the wheel is brought *to the work*, reversing the usual process. Abrasive dirt and grit cannot cause wear because the cross carriage is not in motion. The horizontal ram which supports the grinding head moves in special bearings and is fully enclosed, sealed against dust and dirt. Further accuracy is assured because the wheel can be trued by a stationary diamond which provides a fixed grinding line. It is not necessary to reset the cutter to compensate for wheel wear.

The "ACE" is a universal tool grinder designed expressly for tool grinding—not a general purpose machine *adapted* to tool room work. It is simple to set up. All clearance angles are obtained by direct reading. Operators stand in a natural position with the control lever in easy reach and the work in direct view.



OLIVER Standard "ACE"

This machine is for high speed and light duty carbide grinding. Only two fixtures are required to handle a complete range of tool and cutter sharpening. Clearance angles are obtained by tilting the grinding wheel the desired amount as indicated on a scale graduated in degrees.



OLIVER Heavy-Duty "ACE"

. . . for grinding tungsten carbide cutters and tools in all of their many forms. Because it is for use with hard metals, all components have been designed with rugged going in mind. Like the standard "ACE," grinding is done on the top tooth, not on the side of the cutter. The operator has full vision at all times.

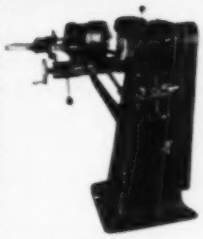
More OLIVER of ADRIAN Tool Grinding Equipment

FACE MILL GRINDER

Completely automatic. A machine tool designed for accurate grinding. Wheel dressed with every stroke.

TEMPLATE TOOL BIT GRINDER

Controlled form grinding for high speed, stellite and tungsten carbide single point tools.



No. 510 DRILL POINTER

Semi-automatic. For drills ¼" to 2" in diameter. No. 21 bench models available for size ½" and smaller.

DRILL POINT THINNER

For low cost reclaiming of drills. Corrects off-center and too-thick webs and out-of-index cutting edges.

DIE MAKING MACHINE

Produces dies, gages, cams, templates, stripper plates, etc. at greatly reduced costs. 5 designs in 2 types.

Just check the coupon for literature on the OLIVER of ADRIAN machine you are interested in. Send it today to . . .

OLIVER of ADRIAN

OLIVER INSTRUMENT COMPANY

1414 E. Maumee St. • Adrian, Michigan

- ☐ Drill Pointer
- ☐ Face Mill Grinder
- ☐ "Ace" Universal Tool and Cutter Grinder
- ☐ Literature only
- ☐ Die Making Machine
- ☐ Drill Point Thinner
- ☐ Template Tool Bit Grinder
- ☐ Quotation requested

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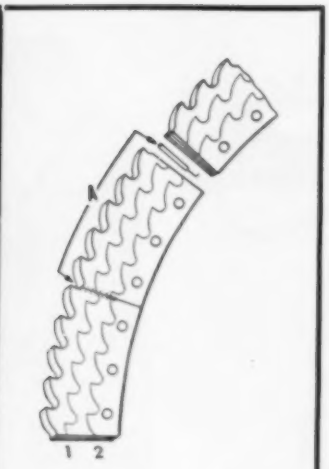
CITY_____ ZONE_____ STATE_____



Exclusive patented pin-lock feature provides permanent and perfect alignment. Aligning pins lock segments together. Eliminate aligning rivets of conventional saws which limit sharpening. With rivets, saws can be sharpened only to line 1. With pins, you can sharpen Disston Segmental Saws to line 2—adding 30% to cutting life.

30% LONGER CUTTING LIFE with a DISSTON SEGMENTAL SAW!

for ferrous and non-ferrous metals

REDUCE YOUR REPLACEMENT COSTS! Each segment has up to 30% extra life, because sharpening is not limited by conventional aligning rivets. Tough-bodied Disston Segmental Saws—of alloy steel—take the strains and shocks of production cutting with less wear.

REDUCE YOUR SHARPENING COSTS! You can sharpen the Disston high-speed steel tooth segments on automatic machines. Teeth are accurately indexed. Actually, Disston segments need sharpening infrequently. And—narrow kerf provides fast, clean cutting with a minimum of waste.

FAST, PROMPT DELIVERY! Large stocks make certain that Disston Segmental Saws report to work in a hurry. Stocks are carried for all popular cold cutting machines. In stock are diameters ranging from 11" to 38".

Diameters up to 63" are available. You can have a Disston Segmental Saw bored to your specifications.

Disston Division, H. K. Porter Company, Inc., Philadelphia 35, Pa.

H. K. PORTER COMPANY, INC.
DISSTON DIVISION

known to the men. Then their decision to continue would be voluntary, and much more likely to be productive of the desired results.

A worker's progress with the company demands some sort of planned education about the plant he works in and the product his company manufacturers and sells. Anyone, whatever his job, can work more effectively if he knows something of the setup and functions of other departments, and their relationship to his department. Knowledge of the component parts of the product and how the part he makes fits into the assembly of the completed unit will help make his own work more efficient. Here is where the school for novices will prove valuable and rewarding to the worker and the company.

Inclusion in the course of basic engineering instruction consisting of explanation of a few simple principles of physics and mechanics will help workers understand more about the machines they operate and undoubtedly help to improve their operating efficiency.

The course should prove interesting and valuable to those men who are seeking advancement with the company. By their response to the teaching and participation in the class room discussions they will show that they are especially well suited for higher positions in the plant.

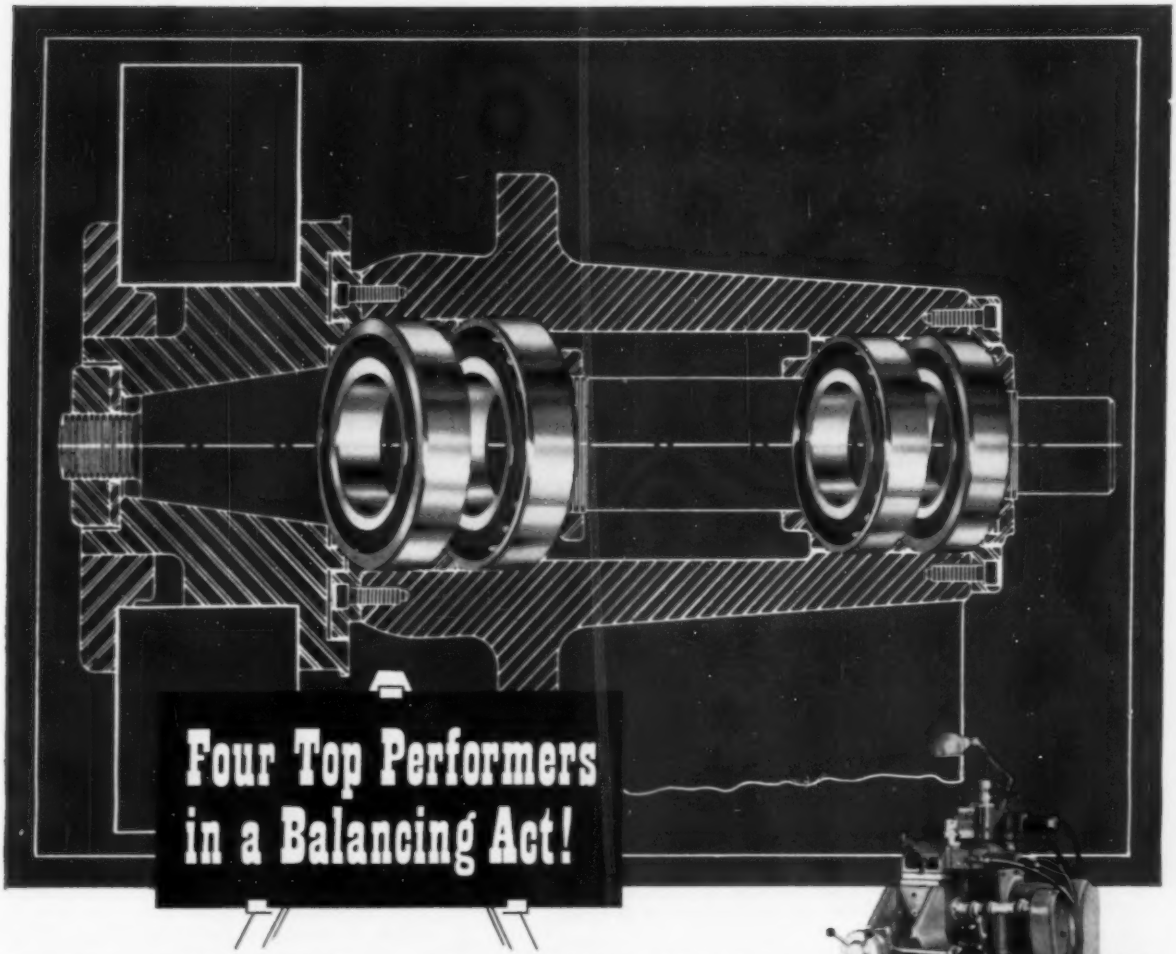
Harry Kaufman
Philadelphia, Penna

OPEN FORUM

If a factory representative is following up performance of new equipment in the shop, should he discuss it with the front office, or will he get a better picture from the actual operator of the machine?

ONE OF THE most difficult of human endeavors is that of self-improvement, that is, improvement from

"I figure every drink of water she takes costs us around fifteen man-hours!"



Four Top Performers in a Balancing Act!

To assure true spindle balance, close running accuracy, and vibrationless performance, Royal Master mounts the massive, heat-treated alloy work wheel spindle of its TG-12 centerless grinder on four Fafnir Super Precision Ball Bearings. The spindle assembly itself is mounted directly into the normalized, stress-relieved, close-grained grey iron head stock.

Besides providing proper balance and smooth spindle operation, the Fafnir Preloaded Super Precision Ball Bearings used in the TG-12 eliminate spindle warm-up time—an important feature where the machine is used intermittently. Moreover, relubrication of the bearings is never required. They are lubricated for life when the machine is assembled.

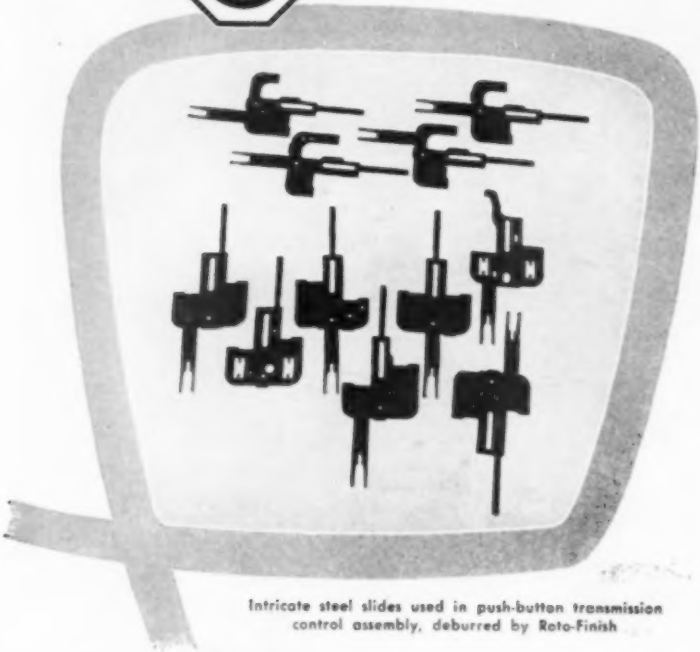
This Royal Master bearing application is a typical example of the Fafnir "attitude and aptitude"—a way of looking at bearing requirements from the designer's point of view and coming up with the right bearing to fit the need. Perhaps the Fafnir approach can be of help to you in finding more economical and satisfactory answers to bearing problems. Write The Fafnir Bearing Company, New Britain, Connecticut.

Royal Master TG-12 Centerless Grinder, Fafnir equipped, is designed for thru-feed, plunge feed, and infeed grinding. It has successfully ground materials ranging from plastics to tungsten carbide. Features include accessibility of both sides of wheel from operating position, for high output and fast checking.

◀ Fafnir preloaded, angular-contact, super-precision ball bearings with composition or bronze retainers are made to highest industry-approved tolerances. Single or duplex bearings like this are used widely on spindle applications.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

and the ROTO FINISH® push button driving... story behind it...



Intricate steel slides used in push-button transmission control assembly, deburred by Roto-Finish

3000 PIECES PER HOUR DEBURRED AUTOMATICALLY

That's the story of one *Roto-Finish* machine installed in a Detroit automobile plant to deburr push button transmission control slides. All the operator does is load parts into the machine. The balance of the 30 minute cycle is entirely automatic. Man power savings are tremendous!

PROCESSING MATERIAL COSTS FOR 100 PARTS—JUST 2¼¢. The cost of processing materials, both chips and compound, is .0223¢ per piece.

SEND FOR YOUR FREE ROTO-FINISH HANDBOOK

PUT ROTO-FINISH ENGINEERING SKILL AND OUR YEARS OF PROCESSING EXPERIENCE to work for you. In either your plant or our laboratory, our process engineers will prove, before you buy, that Roto-Finish provides the finish you want at a lower cost. Phone or write today.

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within. Our greatest and most rapid personal advances are made with outside help—help from our school teachers and our parents. We can make rapid strides when we are young for we have an abundance of assistance and we have not yet become self-satisfied and sure of ourselves.

It is difficult indeed to be honest with ourselves and find faults in our work. However, the existence of this block need not be a serious restriction to our personal development or to the continued improvement of our work. We can circumvent it once we become conscious of it and acquainted with its nature. The process of circumvention takes advantage of another human trait, namely the desire to find fault and criticize. In short, to make improvements we must locate and remove faults. Since it is difficult to find them ourselves we should seek help from those in an advantageous position for observation. We should take a broad view of these criticisms and suggestions and extend careful appraisal to each. In such an appraisal it is well to remember that all new ideas look poor at first, simply because they are new and different. Quite frequently the biggest advancements and the best ideas are those which appeared the most ridiculous at the first appraisal or, perhaps, it is more accurate to say they appeared ridiculous before appraisal.

When an organization is devoting its efforts to the building of machines they must constantly seek improvement. Since improvements come out of suggestions and criticism, the organization should tap the fertile sources of such material. The employees in the builder's plant can often provide good ideas via an employee-suggestion system.

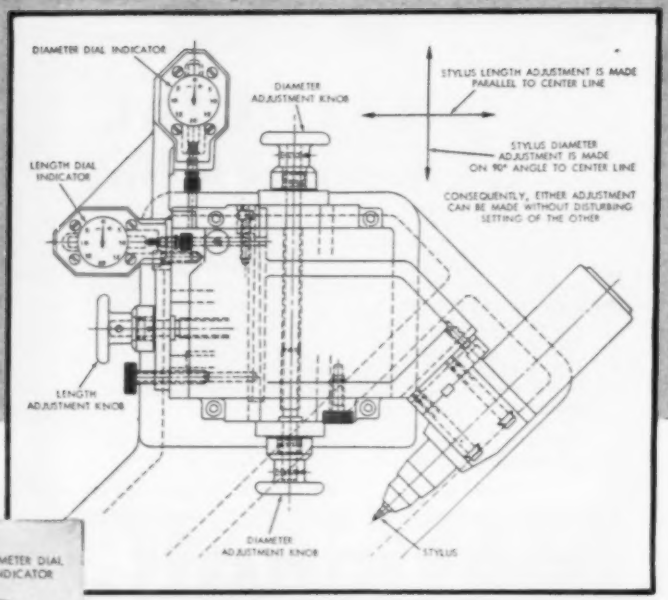
The real big field for new ideas is the people who buy and use the machine.

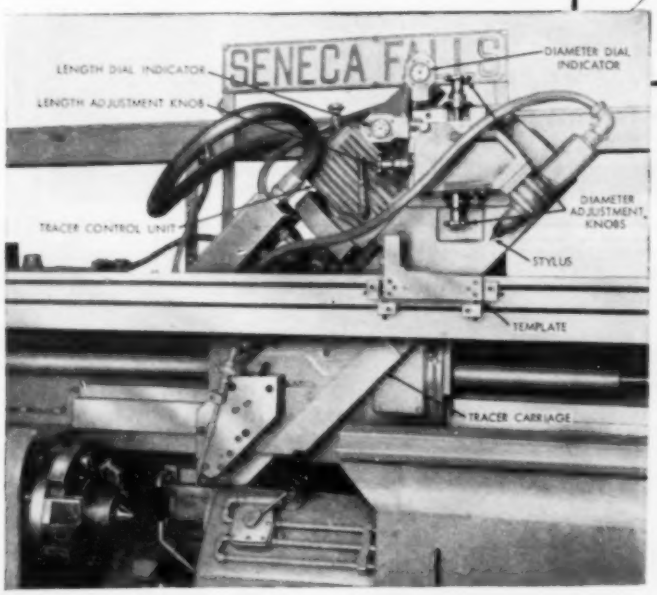
H Koslow
Bronx, NY

"You have reservations?"

YOU CAN SET TOOLS IN SECONDS

on this SENECA FALLS TRACER LATHE


DIAMETER DIAL INDICATOR
DIAMETER ADJUSTMENT KNOB
LENGTH DIAL INDICATOR
LENGTH ADJUSTMENT KNOB
DIAMETER ADJUSTMENT KNOB
STYLUS
STYLUS LENGTH ADJUSTMENT IS MADE PARALLEL TO CENTER LINE
STYLUS DIAMETER ADJUSTMENT IS MADE ON 90° ANGLE TO CENTER LINE
CONSEQUENTLY, EITHER ADJUSTMENT CAN BE MADE WITHOUT DISTURBING SETTING OF THE OTHER



Where it used to take minutes by the old "cut and try" method, it now takes only seconds to adjust tools on the new Seneca Falls Model Q Automatic Tracer Lathes. Diameter and shoulder length accuracy are controlled by the stylus which is adjusted by means of compound slides operating in conjuction with two dial gages. One dial indicates diameter, while the other indicates shoulder length. The operator simply takes an initial cut over the work piece and sets the dials to zero. The work piece is then checked with micrometers to obtain out-of-tolerance readings, after which the stylus is accurately adjusted in one setting, by turning the slide adjustment knobs until the hands on the dials indicate the correct amount of stock removal. After the stylus is properly adjusted for size and length, the hands on the dials are again set at the zero mark.

Diametral and length adjustments are made by the "straight line" method, which does not affect either adjustment when feeding in the tracer slide. See line drawing for explanation.

Another advantage of the dial gages is that tool adjustment for wear is visually indicated on the dial and permits resetting the stylus to zero position when the tool insert is indexed or changed for a fresh cutting edge.

The dial indicator system facilitates a fast changeover from one part to another when used in conjunction with templates designed to compensate for variations in size of the work pieces. This method eliminates even the initial "trial cut," as the first piece turned is accurately machined to the specified dimensions.

SENECA FALLS MACHINE

ENGINEERED FOR PROFIT

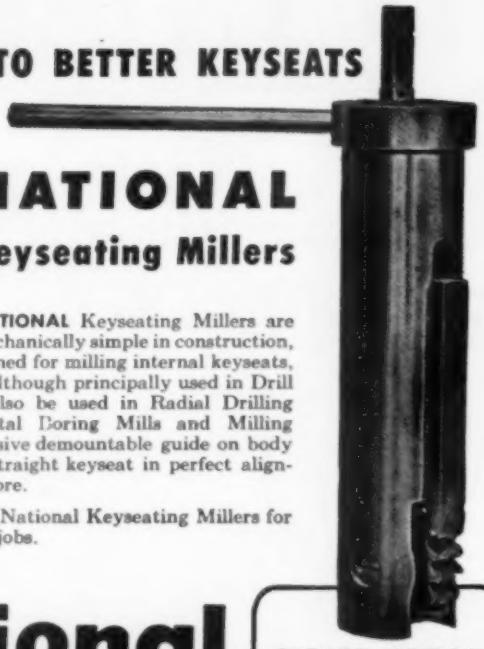
SENECA FALLS MACHINE CO.

SENECA FALLS, NEW YORK

Lo-swing Lathes and Seneca Falls Machine Tools, Automation and Electronics

THE KEY TO BETTER KEYSEATS

NATIONAL
Keyseating Millers



NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

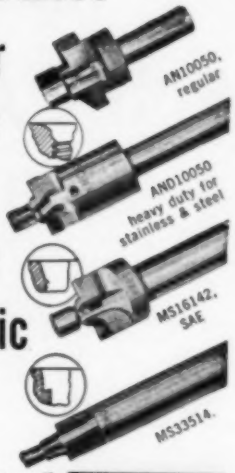
You can depend on National Keyseating Millers for all your keyseating jobs.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17
complete, handy size

IMMEDIATE DELIVERY

contour cutters for popular hydraulic ports!



One pass completes all operations necessary to produce the port contour. Job time cut as much as 3/5! All have carbide cutting edges for long life, smooth finishes. Available in all sizes. Write for prices.

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576 North Prairie Avenue
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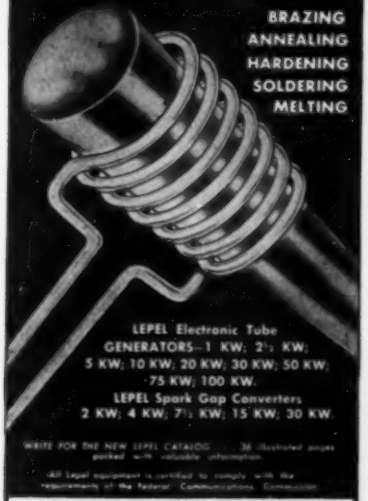

LEPEL Electronic Tube GENERATORS—1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
LEPEL Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW

WRITE FOR THE NEW LEPEL CATALOG ... 36 illustrated pages packed with valuable information

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission

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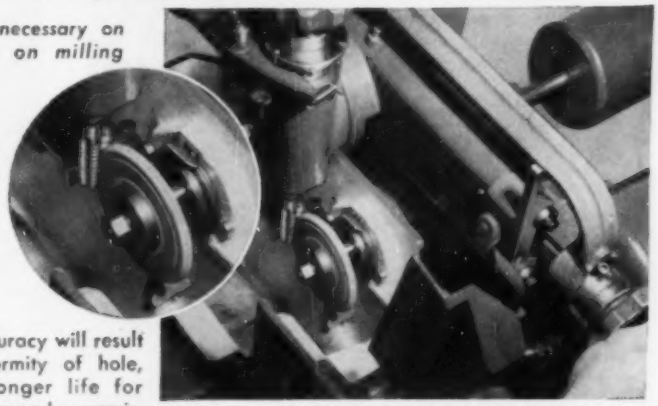
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

NOW – You can control rake or hook angle and insure accurate indexing of cutting edges* of taps with the BLAKE FLUTE GRINDER.

**Just as necessary on taps as on milling cutters.*



This accuracy will result in uniformity of hole, much longer life for your taps and a surprising savings in tap costs.

Keep it sharp — Make 1 tap do the work of 6 with The Blake Flute Grinder.

Write for bulletins on BLAKE Tap Sharpening Machines

EDWARD BLAKE COMPANY INC.
MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS
435 CHERRY ST., WEST NEWTON 65, MASS.

Exclusive Distributors of:
Black Diamond Drill Grinders • Surface Finish Standards • Worcester Drill Grinders.

Westinghouse RESISTANCE WELDING CONTROL for new or replacement units now in stock for immediate shipment

No more costly, time-consuming delays . . . new strategic-area stocking program means that any standard Westinghouse resistance welding control, combination or individual timers, can be shipped and on its way to your plant within 24 hours.
Complete line stocking by Westinghouse of these industry-approved standards insures prompt availability for your every plant need.
For complete information on Westinghouse resistance welding controls, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Penna.
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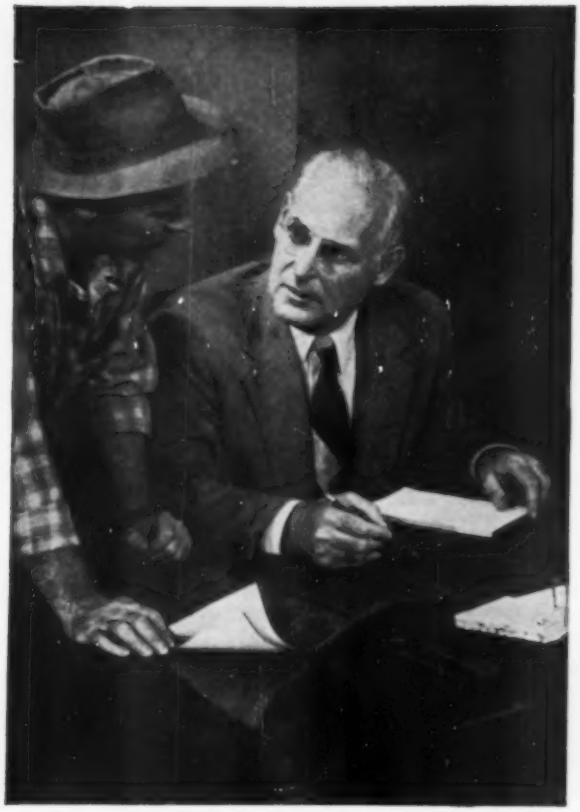
POWER-UP starts with CONTROL

YOU CAN BE SURE...IF IT'S Westinghouse



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Get those tough special design jobs off to Columbus Die-Tool for quick action. An outstanding engineering staff backed by 50 years of Company experience can make tough jobs look easy.

Whether it's special tools, jigs, fixtures or even special machinery, you'll find that CDT can build them better, faster and more economically. That's why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool.

Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

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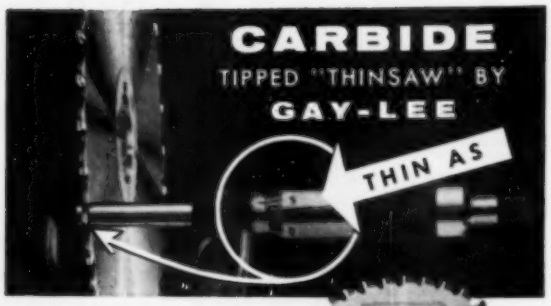
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*



Ideal for precision, high-production sawing, slitting, slotting! Exclusive Gay-Lee design features long-wearing carbide tips brazed into a circular seat which provides more brazing area, greater mechanical strength and maximum tip security. (Patented, U. S. Pat. No. 2675603, manufactured under license.)

- Thicknesses low as .030"
- Thickness tolerance can be held to .0001"
- Wafer-thin for the most delicate work
- Maintain positive alignment and rigidity
- Cut to full depth without runout
- Available in any carbide grade
- O. D. from 1½" to 10"
- Made to any tooth form

CARBIDE SAW SPECIALISTS

GAY-LEE COMPANY
CLAWSON • MICHIGAN

Write for free literature, send us details of your problem, or bring your problem to Gay-Lee Booth No. 1919, A.S.T.E. Exposition, Philadelphia, May 1-8, 1958.

A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES
Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering
CAMS OF ALL TYPES
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Contract production; special automatic machines
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Stops Losses
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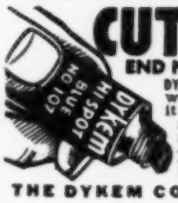
With DYKEM Steel Blue
Without DYKEM Steel Blue
Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2301B North 11th St. • St. Louis 6, Mo.



CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301B NORTH 11TH ST., ST. LOUIS 6, MO.

RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Select proper bolt diameter

An erroneous rule of thumb worth forgetting is that no bolt under ⅝" should be used where fastened members are under stress. Yet bolts ½-inch and smaller take plenty of external loading.

HOW TO LOOK AT IT

Primarily, you have to satisfy the stress requirements . . . the load. So select bolts on that same basis: the actual strength to sustain that load.

Calculating the strength requirements will tell you what bolt tensile, size, and number you need. If smaller bolts suffice, use them to avoid the penalty of overdesign. Holes can be smaller which means faster drilling and tapping. You have a chance to save materials since with smaller bolt holes, fastened members can often be made smaller too. You may also be able to standardize on a single size, saving assembly-line time.

SIZE VS. SAFETY

Remember that for a given grade of material, size tells you *capacity* of a bolt, not its *safety*. If you *tighten* a bolt to capacity, then you get safety. That's why a smaller bolt properly tightened is better and safer than a larger bolt sloppily tightened, especially where the loads are dynamic. Obviously, you reduce risk of under-torqued bolts as you reduce their size.

The new RB&W "SPIN SEAL" fasteners have spring-type washer with adhering flow-in seal . . . pre-assembled to standard machine or tapping screw.

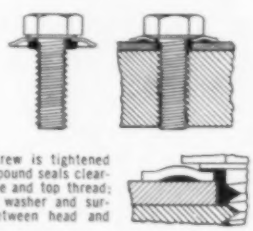
Flow-in sealant is confined by washer. Note how seal fills space under head and flows around and into threads in tightened SPIN-SEAL screw.

New SPIN-SEAL* screws give leakproof fastening

Here is a new type of composite fastener that seals by means of a unique flow-in sealant and washer.

ASSURES TRIPLE SEAL

Concave in shape, the heat treated springy washer confines and controls the flow of sealing compound. Tightening the screw forces sealant into various spaces around (1) threads, (2) head and (3) clearance hole to give hermetic sealing.



When screw is tightened the compound seals clearance hole and top thread; between washer and surface; between head and washer.

The washer has ability to conform to curved surfaces and still seal securely against hydrostatic pressures and wind driven water. Its spring tension and flat rim give the added advantage of dynamic metal to metal seal.

ONLY THE SCREW TURNS

Washer does not turn with the screw. This prevents twisting or tearing the sealing "gasket", marring of polished surfaces, or gouging of painted finishes.

The flow-in gasketing compound is plastic rather than elastic. Stable and non aging, it won't split or ozone-check under pressure. It gives controlled flow into clearance spaces. Compounds are available to seal out water or oil.

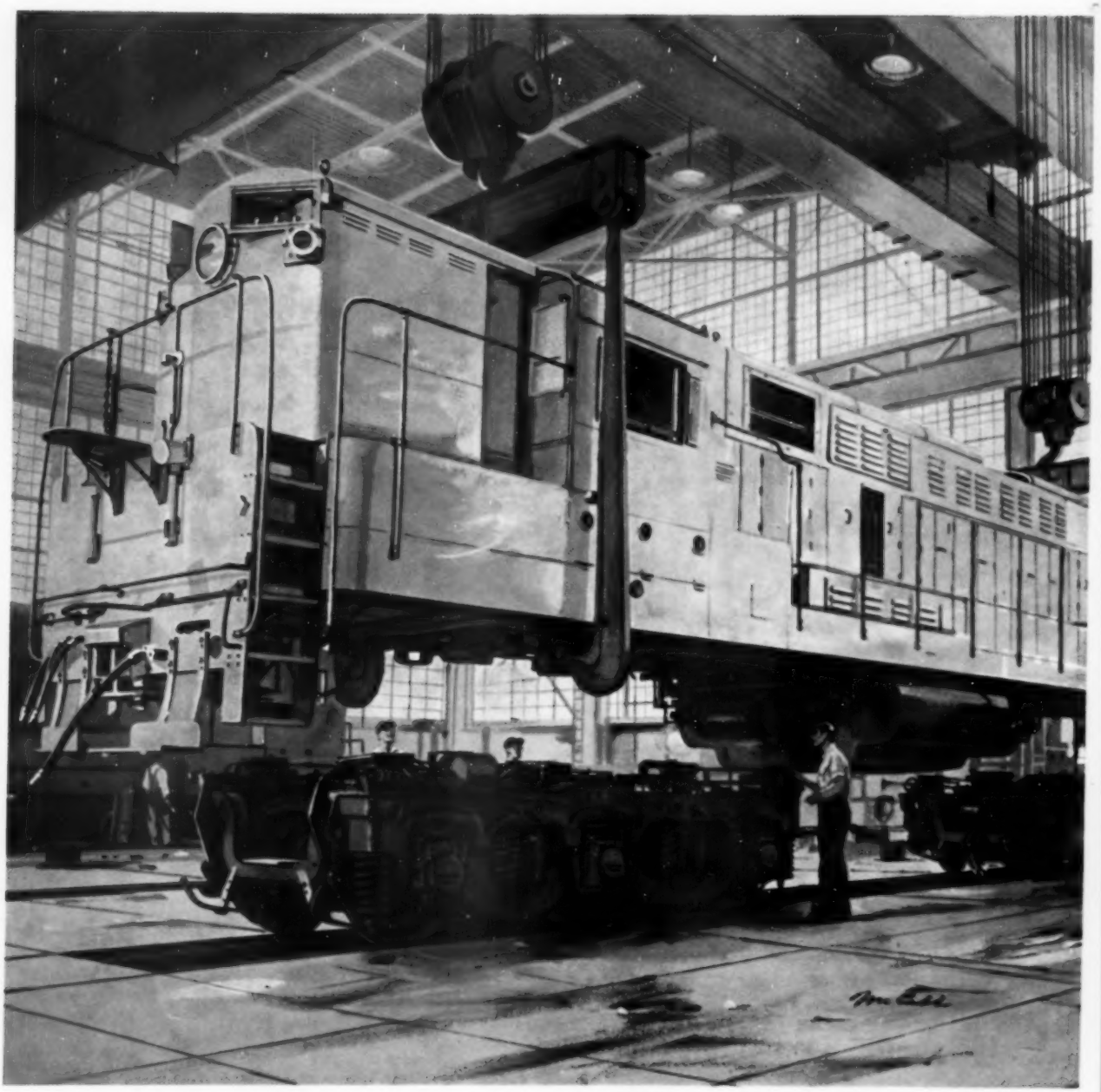
Send for Bulletin SS-1 which gives details on RB&W "SPIN-SEAL" fasteners. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

* T.M.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Correct Lubrication in Action . . . in the

Maintenance cost cut



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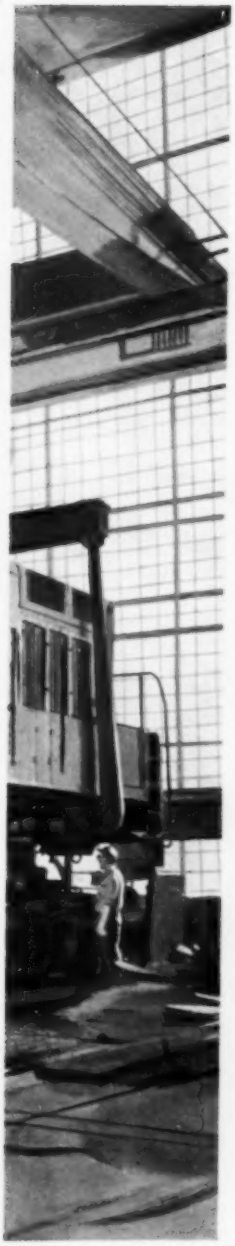
Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

Heavy Equipment Industry!

$58,500 in one year!



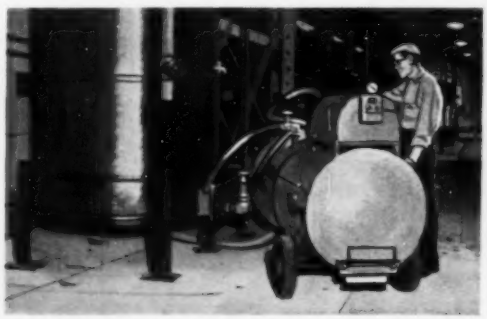
One of the many maintenance and production savings achieved by Fairbanks, Morse & Company with the help of Socony Mobil

In 1949, Fairbanks, Morse & Co. installed a Mobil Program of Correct Lubrication. This decision has continually paid off, as it can for you, by directly contributing to company profits.

To illustrate: First year after installation of a Mobil Program in the company's Beloit, Wisconsin plant figures showed machine repair maintenance costs were reduced 26.3 percent . . . $58,500. In fact, plant supervisors and Mobil engineers have co-operated so effectively under this service that today . . . nine years later . . . the Program shows continuing benefits, with the result that machine repair maintenance costs are now 49 percent lower than when the Program was inaugurated.

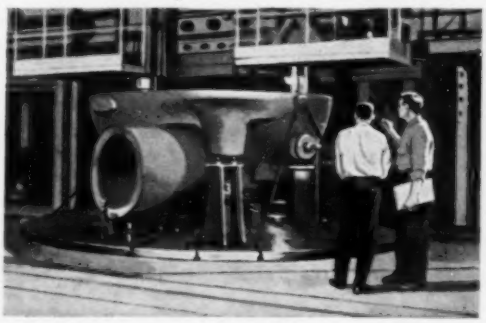
In dollars, this saving yearly is in excess of *twice the cost of plant lubricating oil requirements.* Here is another example of how Correct Lubrication in action can reduce maintenance costs and *increase profits.* It proved effective for this leading builder of heavy equipment. Why not for you?

In-plant training conducted by Mobil specialists demonstrates proper lubricant application and maintenance procedures . . . teaches Fairbanks, Morse personnel to recognize and prevent trouble before it results in downtime, repair costs.



Disposal of thousands of gallons of water-soluble cutting oils posed serious, expensive problem. Mobil recommendation of chemical separation process allowed disposal through plant sewage system . . . avoided stream pollution, saved substantial sum.

Control system cuts downtime:—Mobil lubrication charts cover plant's 2,300 machines . . . specify correct lubricants, lubrication periods . . . assure follow-through on application and maintenance.



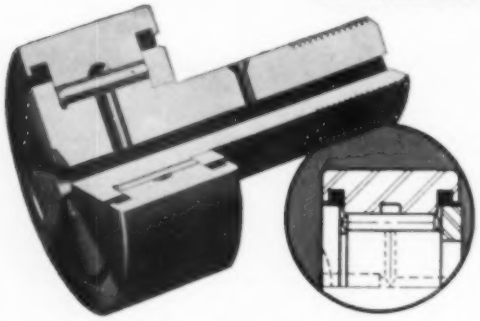
High temperatures of Boring Mill way lubricant lowered viscosity . . . resulted in pressure drop, causing machine to stop. Mobil recommendation solved problem, allowed continuous operation.

Correct Lubrication

Another reason You're Miles Ahead with Mobil!

BEARING TIPS by McGill

sealed CAMROL® bearings lock out contamination in critical cam follower applications

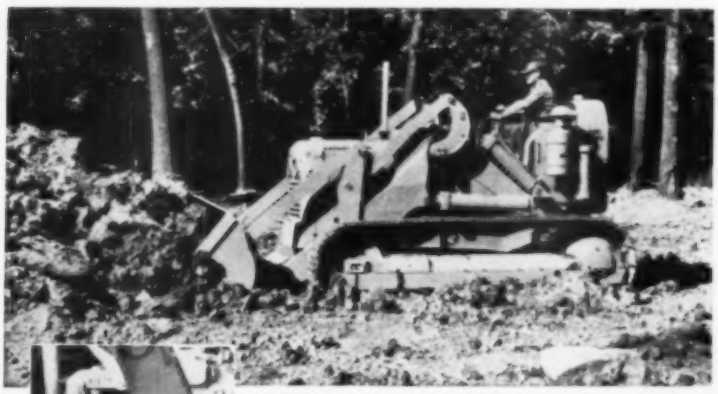


Now Sealed and Prelubricated

The new SCF series of the famous CAMROL cam follower completely seals out dirt, chips, moisture, etc. — an important advantage where the life of an ordinarily open mounted cam follower can be materially increased with adequate protection against contamination. Also the sealed bearing is pre-lubricated with provision made for easy re-lubrication, if desired, through either end of the stud.

Specially treated synthetic seals are contained in the outer race undercuts over the stud flange and roller retaining washer. For added protection, all external surfaces of the bearing are treated to provide a corrosion resistant, black ferrous oxide surface.

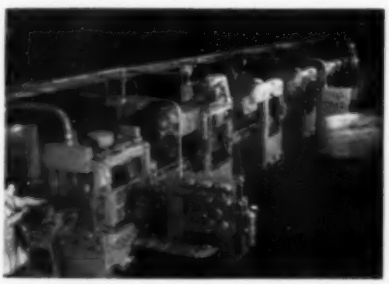
These same advantages are available in the SCYR sealed series Cam Yoke Roller (without stud). Specify CAMROL bearings with the built-in seals that preserve cam follower dependability in critical cam action, support or track roller application.



Built-in seals protect and preserve CAMROL® bearings from contamination in CATERPILLAR-built Traxcavators®

McGill SCF series sealed CAMROL bearings provide the cam action that positions the bucket of the 977 Traxcavator unit at the selected digging angle. Mounted on bell crank arms that are actuated by contact with a cam shoe on a hydraulic cylinder linkage, these bearings are operating in the open and exposed constantly to dust, dirt and moisture. External surfaces have a black ferrous-oxide finish to prevent corrosion. These sealed McGill cam followers eliminate the need for relubrication and maintenance after installation. Caterpillar uses other McGill bearings including twelve CYR series cam yoke roller bearings in the flywheel clutch.

378 sealed CAMROL® bearings guide engine blocks in INGERSOLL automatic milling machine



The sealed CAMROL bearings used in this machine, guide cylinder blocks during transfer through various milling, boring and drilling operations. The bearings, used in place of guide bars, eliminate surface scratching of the 200 to 300 pound blocks which are transferred at speeds up to 400 feet per minute. Blocks are processed at the rate of 95 per hour. Ingersoll reports freer movement, accuracy of positioning and materially longer bearing life due to the new design that seals metal chips out of the bearings.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL®
Precision Needle Bearings

McGILL MANUFACTURING COMPANY, INC., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA

Do the **BIG** jobs . . . and the small ones too on a **BRYANT**

No matter what your internal grinding problem may be, it can be solved effectively with a Bryant Internal Grinder.

Bryant's great variety of manual, semi-automatic and automatic grinders is your assurance of a machine that is tailored to meet your production requirements.

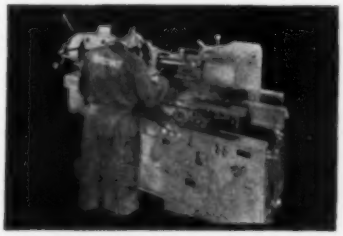
Investigate how Bryant's engineering services can help you attain higher production at lower operating costs.

THE "CENTALIGN", completely new in concept and design, is ideal for the long run, high production grinding of straight bores, tapers and bearing raceways. Maximum swing, 10", grinding stroke, 1".

MODEL 1460 Hydraulically operated. Chuck swing of 60", total wheelslide stroke of 21"; maximum grinding stroke of 16".

MODEL 1109 A precision internal grinder, suitable for covering the range of smaller bore sizes. Total swing of 9"; maximum grinding stroke of 3½".

MODEL 1116 Tops for both toolroom and general production work. Total chuck swing 16"; maximum grinding stroke 8".



MODEL 1316-J Hydraulic Internal Grinder. For combined bore and face grinding. Two wheelheads on a single wheelslide provide exceptional speed, accuracy and versatility. Maximum swing, 16", maximum grinding stroke, 8".

BRYANT Chucking Grinder Co.

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will speed your work
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Top plate raises and lowers for fitting operations and rotates 360° to give easy access to die.

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From the *American Machinist* Library of *Tips for Top Shop Men*

THE common belief that "perishable tools" are written off when they go out to the machine is one of today's most expensive notions. Unless control is exercised *in use* as well as in stocking, the machine, method or man that breaks or ruins an excessive number of tools is never spotted. In one test, ratio of tool use on two machines of the same type on the same job was 1 to 7.

New Bite for POWER HACK SAWS

GUILLOTINE DuWeld PRO-SET

WITH

GUILLOTINE DuWeld® PRO-SET
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POWER BLADES

• Guillotine DuWeld Pro-Set Power Blades feature a completely new concept in sawing.

Teeth and gullet capacities are identical in size but the amount of set increases in infinite degrees from starting to finishing ends of the blade. Impact at start of stroke is reduced 50%.

Metal is gradually and smoothly displaced instead of being "hogged" out. Chip load per tooth is greatly reduced.

Progressive cutting action is constant regardless of size of work piece. Every tooth is a working tooth resulting in 33⅓% more cutting action.

The chips are the proof. The tightly curled chips, generated by DuWeld Pro-Set Blades, are extremely elongated triangles when examined under glass, showing the progressive tooth loading action.

SEND FOR FREE BLADE TENSIONING CHART —

DESCRIBES THE NEW SIMPLIFIED *COUNTED TURN* METHOD. ELIMINATES GIMMICKS AND GADGETS.

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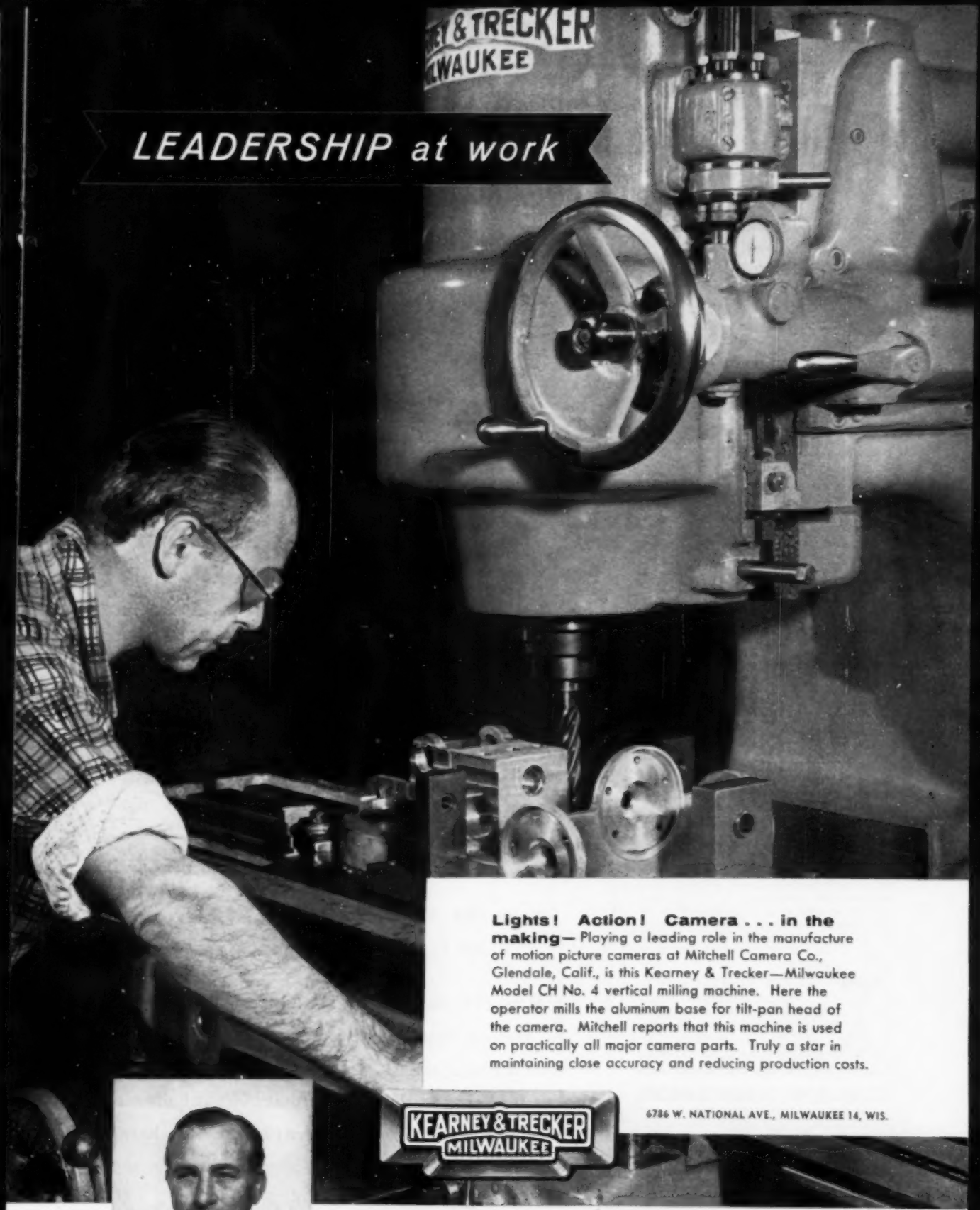
THE E. H. WACHS CO.
1525 North Dayton St., Chicago 22, Ill.
Phone Michigan 2-4650



LEADERSHIP at work

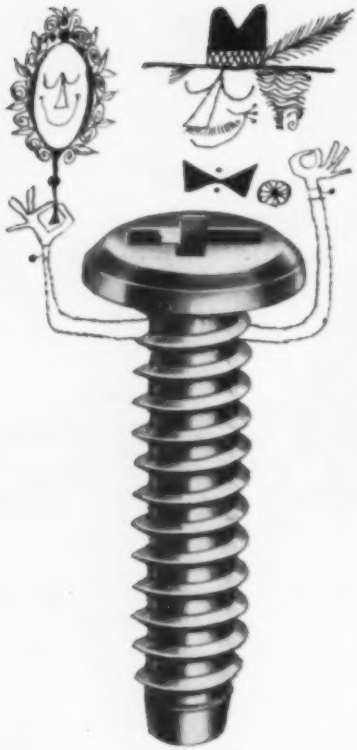
Lights! Action! Camera . . . in the making— Playing a leading role in the manufacture of motion picture cameras at Mitchell Camera Co., Glendale, Calif., is this Kearney & Trecker—Milwaukee Model CH No. 4 vertical milling machine. Here the operator mills the aluminum base for tilt-pan head of the camera. Mitchell reports that this machine is used on practically all major camera parts. Truly a star in maintaining close accuracy and reducing production costs.

KEARNEY & TRECKER
MILWAUKEE

6786 W. NATIONAL AVE., MILWAUKEE 14, WIS.

Kearney & Trecker staff photo by Ron Johnson

Kearney & Trecker's man on the job . . .
Dave Schnabel of Moore Machinery Co., Los Angeles, analyzed Mitchell's production and recommended the CH vertical. *For expert milling counsel, call the Kearney & Trecker man near you. And remember to ask him, or write direct, for free, comprehensive catalog.*



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Build lasting good looks—sparkling sales appeal—into your aluminum products with Alcoa® Aluminum Fasteners. Get perfect color match, avoid discoloring and weakening corrosion. Avoid ugly stains with bright, carefree Alcoa Aluminum Fasteners.

With Alcoa Aluminum Fasteners you are protected against galvanic and atmospheric corrosion. And they are readily available in all standard types and sizes at your local Alcoa distributor; or call your nearest Alcoa sales office. Look in the Yellow Pages of your telephone directory.

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IE-500 Six models with ranges 8" to 42". I.D. or O.D. in increments of 6". Larger sizes to order. Two inch adjustable gaging depth. Indicators available to .0001". Companion Set Masters available in all ranges.

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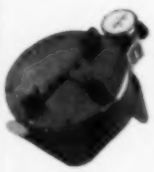
BC-700 A combination I.D. — O.D. gage with fine setting adjustment and variable contact pressure. Ranges: internal 5/16" — 7"; external 1/2" — 7". Jaws adjustable to 1/4" for contact height. Other models available.



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SG-100 An adjustable, all-purpose snap gage with fine adjustment. Range 1/8" — 14" in 9 frame sizes. Carbide anvils, adjustable backstop. Base (not illustrated) converts unit to bench comparator. Other models available.

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BC-300 An inclinable (25°) thickness and depth gage with great versatility. Fine setting adjustment, replaceable reference anvil — stable and accurate.

From the *American Machinist* Library of *Tips for Top Shop Men*

IF you're planning to introduce a labor-saving method that will displace men, and you know there'll be a kickback, get it set to go anyway. Then wait for "evaporation" — normal quits and dismissals—to cut your working force to the newer, lower level. There'll be no trouble—if your men trust you and the company.

USE NON-FLAMMABLE, NON-TOXIC, ODORLESS

Immunol

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FOR ALL METALS

Users get outstanding benefits when they replace flammable, toxic solvents with IMMUNOL. The following is typical of the many case histories in our files: "We estimate IMMUNOL saves us $30,000 to $40,000 per year in materials, time and labor alone when used in tumbling stainless steel jet engine blades."

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• IMMUNOL does much more work—faster, easier and less expensively—than soaps, alkalies and flammable toxic solvents. It is a powerful wetting agent, the original non-alkaline, non-acid detergent and rust preventive that quickly cleans, degreases and rustproofs in *one* operation. Here's how you can use IMMUNOL:

• **AS A BUCKET SOLVENT** to remove oils, compounds, soils, greases, gummy deposits from any metal.

• **TO REPLACE SOLVENT AND VAPOR DEGREASING.** IMMUNOL is very efficient in this application. The metal will be rustproofed and operators will not be bothered by odors, skin irritations or the danger of fire.

• **TO REPLACE OR IMPROVE ALKALI CLEANERS.** IMMUNOL can be used in many places where alkali cleaners are used without alkali burn. It is also used as an additive to alkalies to reduce the time cycle.

• **FOR TUMBLING METAL.** IMMUNOL can be used (1) before tumbling as a cold dip to remove punch press oils (2) as a rust inhibitor for the barrel and parts (3) in the barrel as a cleaner (4) as a dip rinse.

• **TO REMOVE BUFFING COMPOUNDS.** IMMUNOL is very effective in this application.

IMMUNOL is inexpensive. Only a few ounces per gallon of water are required to produce a gallon of solution which can be used over and over again. Write, wire or call for a free sample.

There is a family of IMMUNOL *products that produces outstanding results in many other metalworking applications. We'll send you details on these applications, too.*

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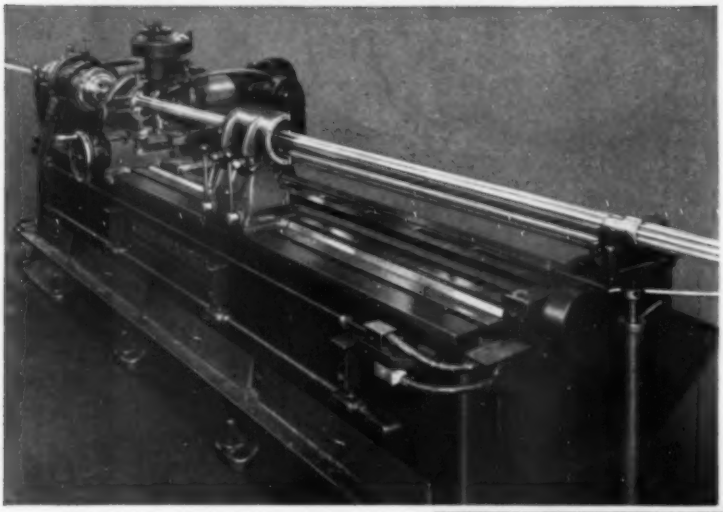

The LEES-BRADNER SPLINE HOBBING MACHINES

These quick facts about Lees-Bradner SH Spline Hobbing Machines make them the most versatile of their type ever made:

- Extra long beds available to hob splines up to 144" between centers.
- Large hole in work spindle handles pieces up to 6" in diameter.
- No clumsy obstructions to interfere with loading and unloading.
- Machines operate with push-button controls within easy reach of operator.
- Can hob either straight or helical splines plus spur and helical gears.
- For the complete story send for your free SH Spline Hobber brochure.

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Rigid inspection from first to last insures exact compliance with customer specifications. These 61.274" O.D., 5" F., 56.187" I.D., 108 T., 1¾" C.P. semi-steel ring spur gears and steel spur pinions—8.355" O.D., 5½" F., 13 T., 1¾" C.P., are being given final checks before shipment. Accuracy and prompt delivery are bywords at Stahl Gear. Our estimate will convince you.

SPURS TO 72" PD. 1 DP
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VK THREAD MEASURING WIRES

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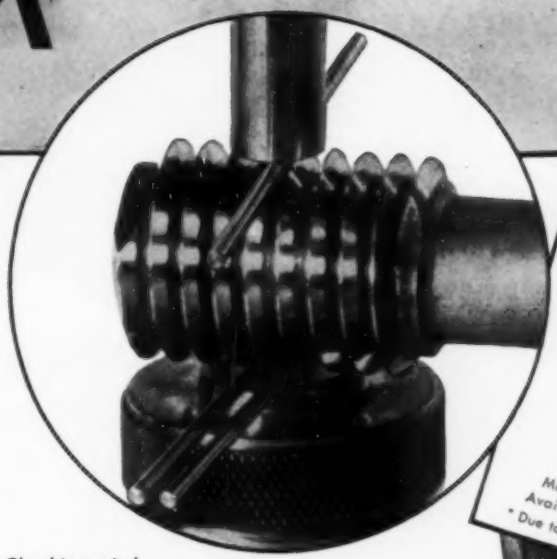

Checking pitch diameter of thread gage by three wire method on VK Light Wave Micrometer.

VK STANDARD THREAD WIRES
Now up to 75% INCREASED ACCURACY
IN YOUR P.D. MEASUREMENT
For all standard Unified and American Threads 2 to 80 P
When you order the NEW
VK CALIBRATED THREAD MEASURING WIRES WITH MATCHED CONSTANTS
Max. Theor. Meas. P.D. Error* = .000015"
Available from stock at no increase in price.
* Due to effect of wire diameter

Every set of VK Standard Thread Measuring Wires, in addition to being within .000020" of best size, is now calibrated and furnished with matching constant. In many cases this will result in considerably more accurate pitch diameter measurements. These wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 H.S. pictured at the right will fill your needs. Similar sets to ± .000020" accuracy are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used.

Set No. 20 H.S. Thread Measuring Wires

Set No. 20 H.S. Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires....$135.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

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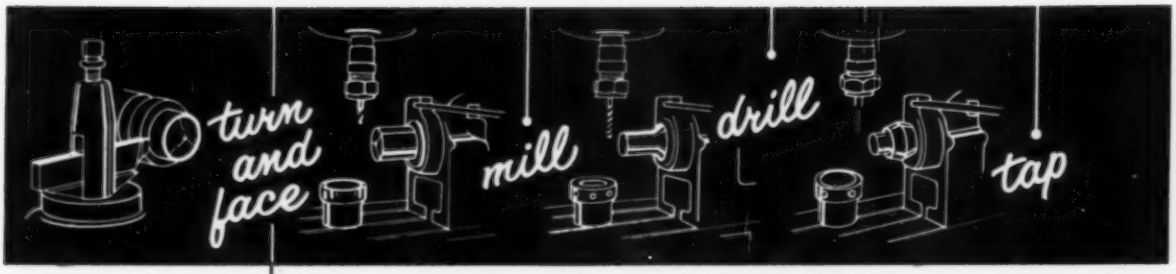

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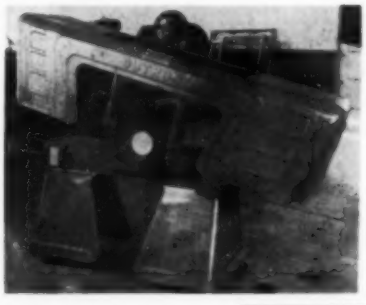

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45 cuts — 6"
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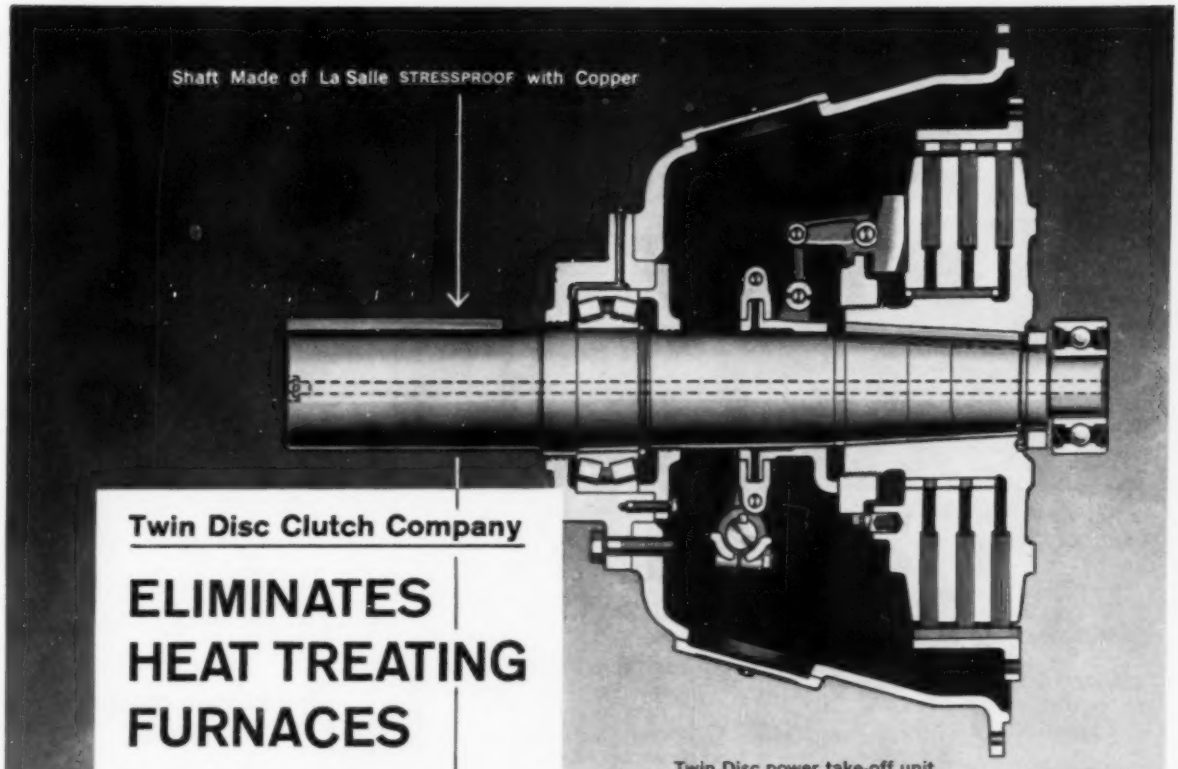

Twin Disc power take-off unit
Used to transmit power from industrial internal combustion engines.

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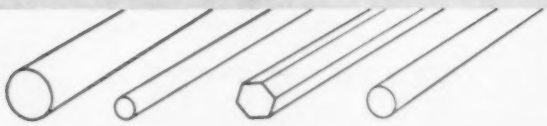
by using

STRESSPROOF®

with copper

STEEL BARS



In Racine, Wisconsin, Twin Disc Clutch Co. saved money on a plant addition by eliminating heat treating furnaces . . . and they continue to save on part costs by using a material which needs no heat treatment . . . STRESSPROOF.

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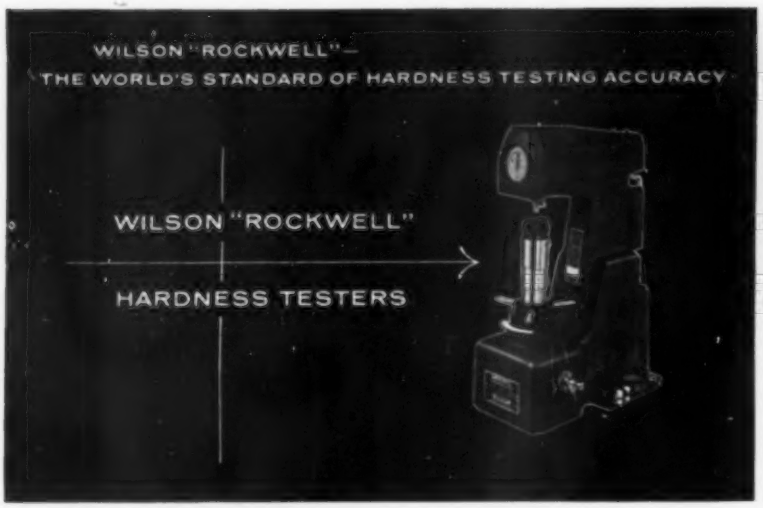

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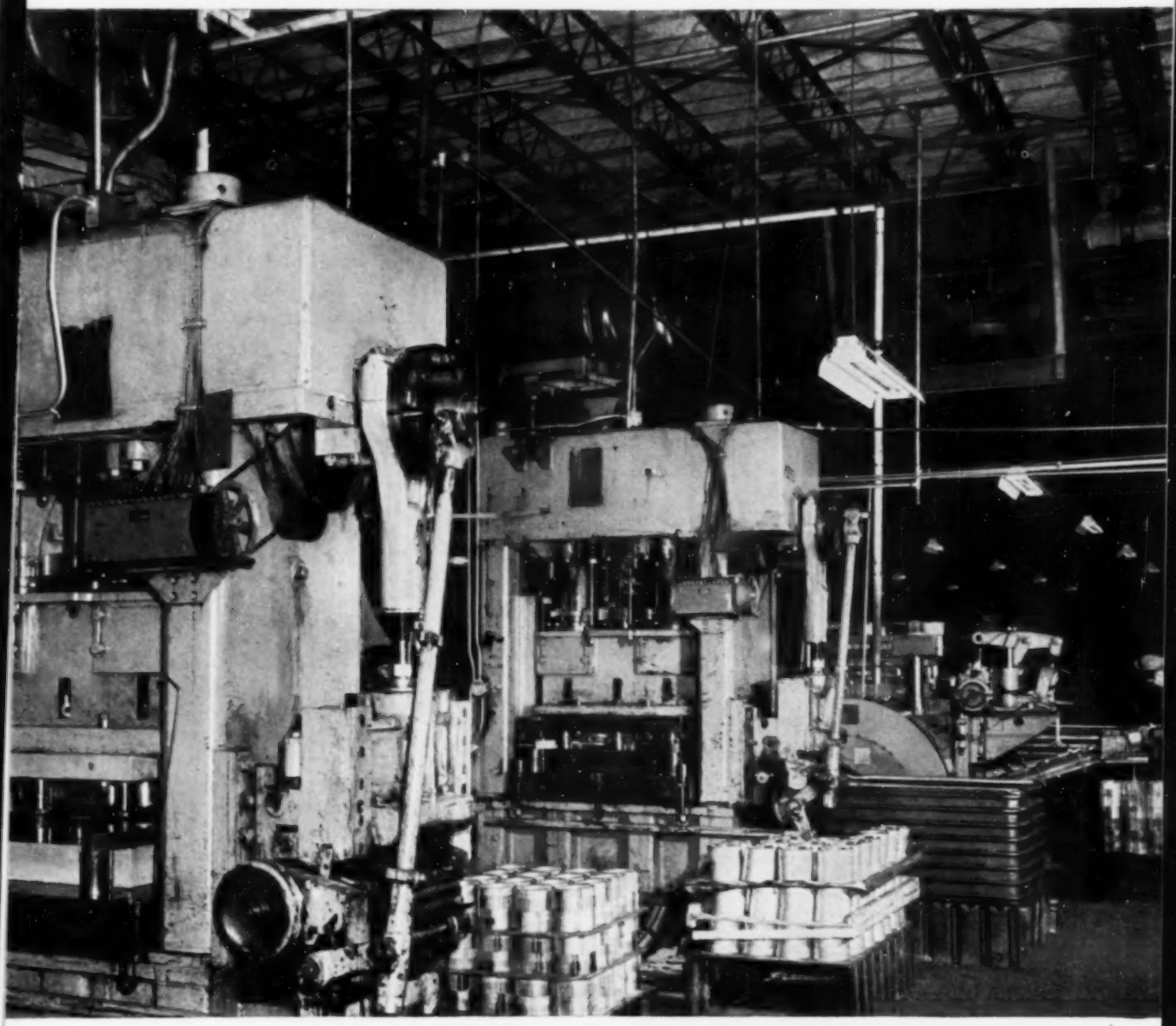

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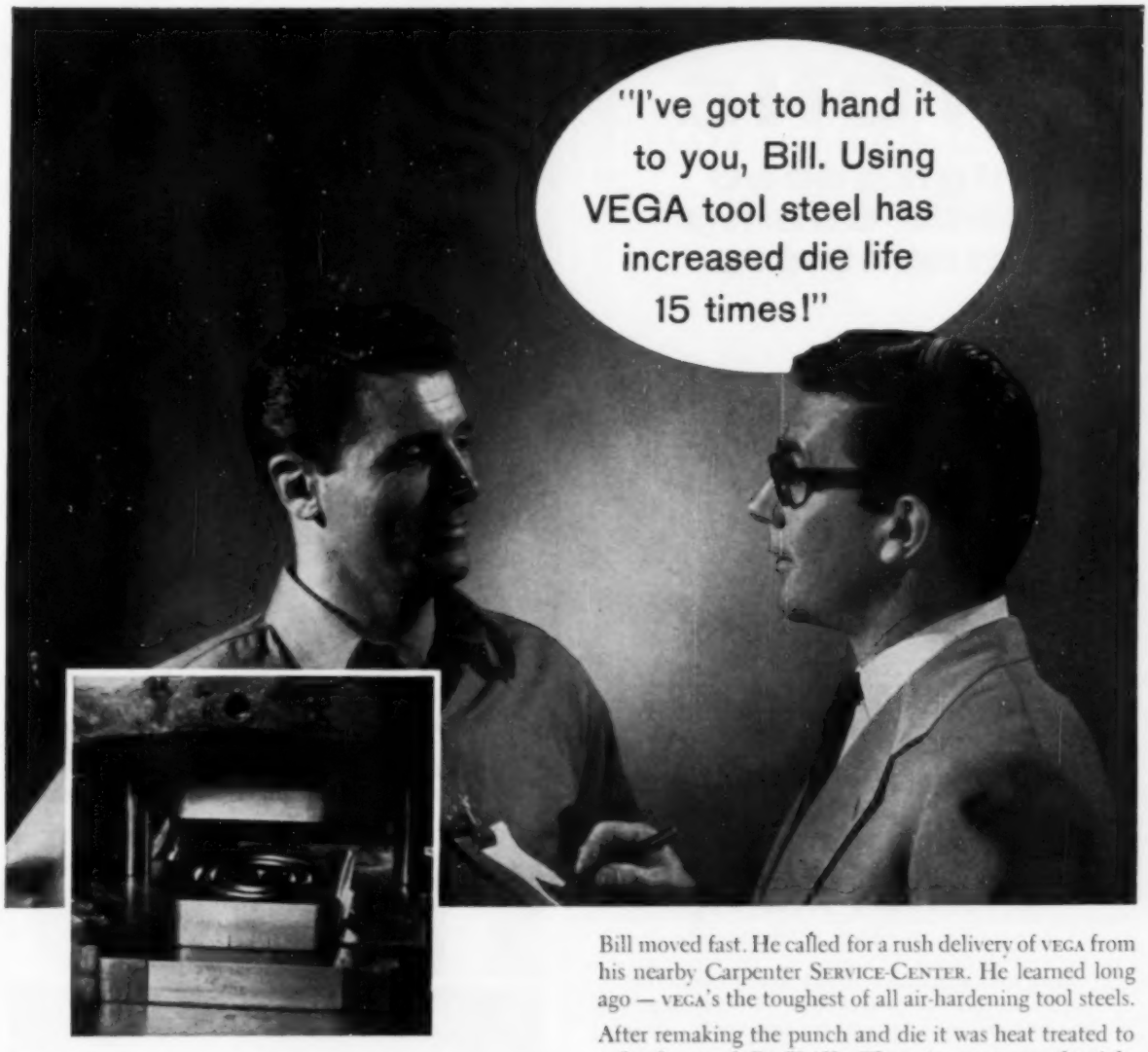

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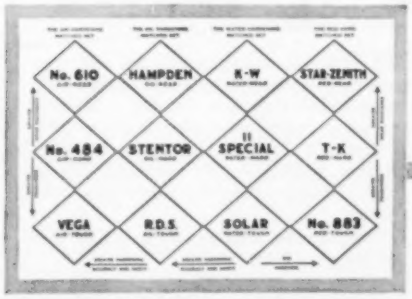

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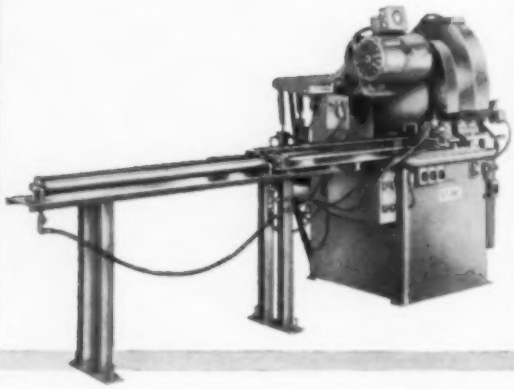

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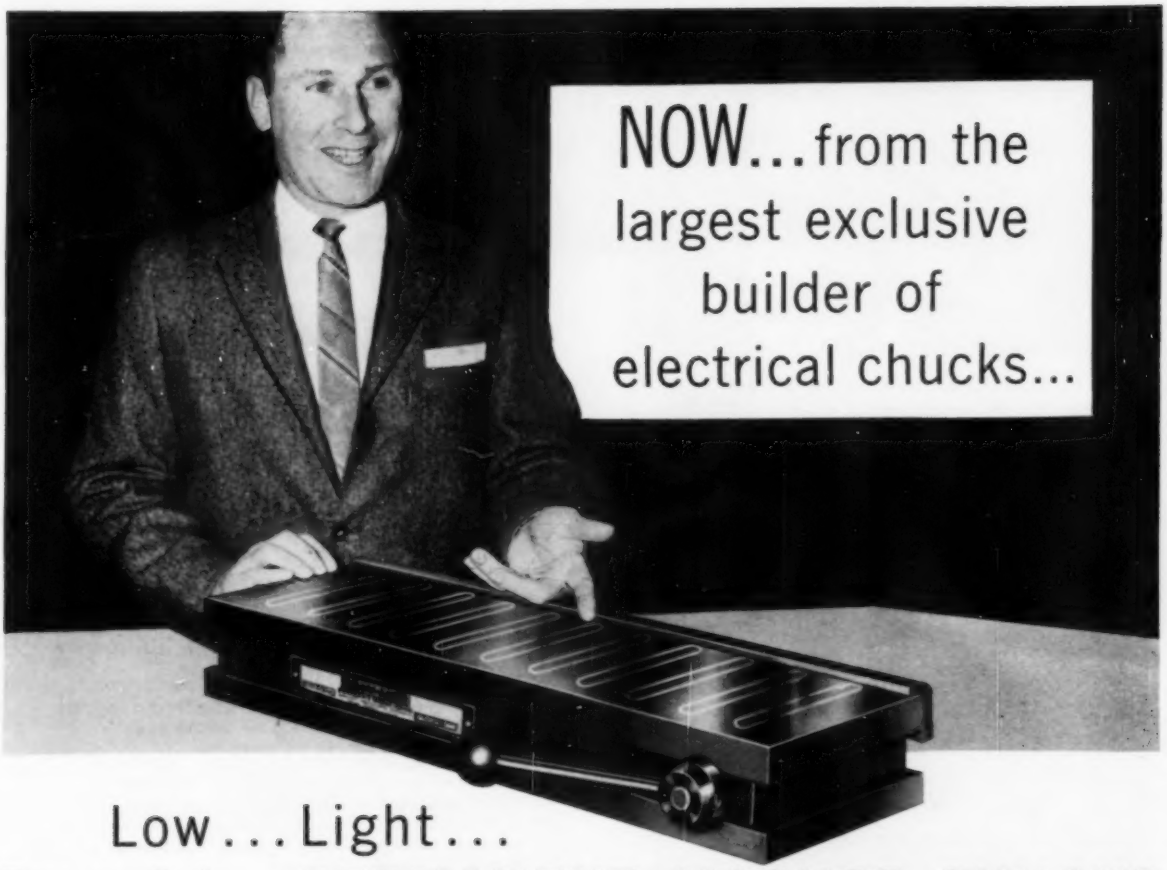

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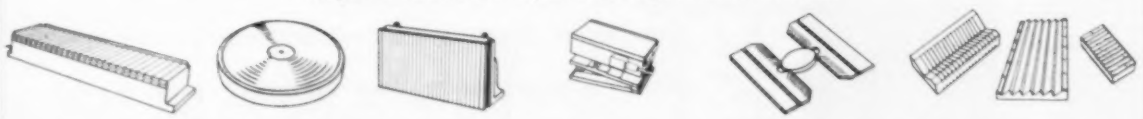

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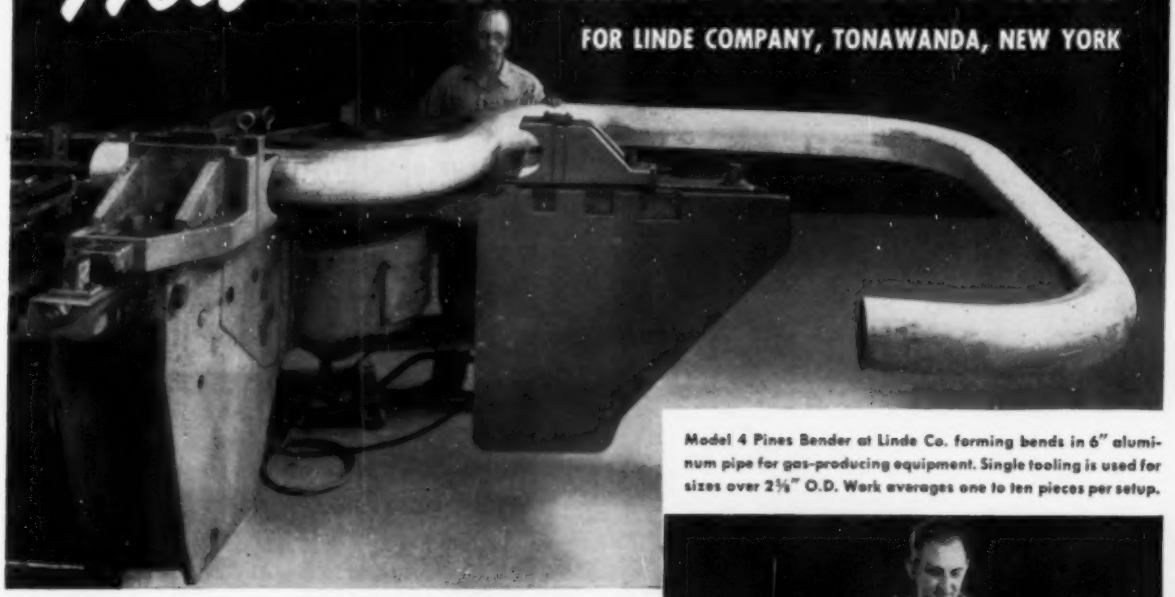
How SHORT-RUN BENDING PAYS OFF 3 WAYS

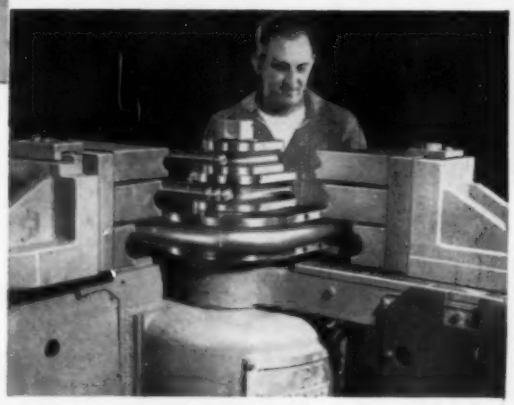
FOR LINDE COMPANY, TONAWANDA, NEW YORK



Model 4 Pines Bender at Linde Co. forming bends in 6" aluminum pipe for gas-producing equipment. Single tooling is used for sizes over 2⅛" O.D. Work averages one to ten pieces per setup.

Diverse Jobs Now Handled on Two PINES Machines

Here's another example of how extremely short runs can be handled efficiently and profitably on Pines Bending Machines. At Linde Company, Division of Union Carbide Corporation, Tonawanda, New York, a large Pines Model 4 and a medium-sized Model 2 Machine are now employed to make bends in a variety of copper alloy, stainless steel, and aluminum tubing. Tube sizes range from ½" up to 6" O.D. Lots average from one to ten pieces per setup. Results show a three-way saving. A large number of costly fittings previously used in fabricating oxygen and inert gas equipment has been eliminated. This, in turn, has effected a substantial reduction in the number of welding operations required. In addition, the facility for making bends quickly and as required has made possible a substantial reduction in inventory investment.



View of stacked die tooling which permits individual bending of three different tube sizes (1⅝", 2⅛", 2⅝" O.D.) without tool changes. Simple machine settings handle different angle requirements.

Multiple Dies Minimize Setup Time

As illustrated, for work up to 2⅝" O.D., a number of multiple stacked dies are employed which substantially reduce setup time. Tools are designed for interchangeability between the Model 2 and Model 4 machines. This permits handling as many as seven different tube sizes without a tool change. The ability to handle different bend angles that a given job may require by simple settings on the machines, contributes also to the efficiency the Linde Company has achieved in handling their requirements.

Over-all view of Model 4 machine equipped with three mandrels and stacked dies. Selection of standard radii also minimizes tooling and setup requirements over a wide range of sizes.

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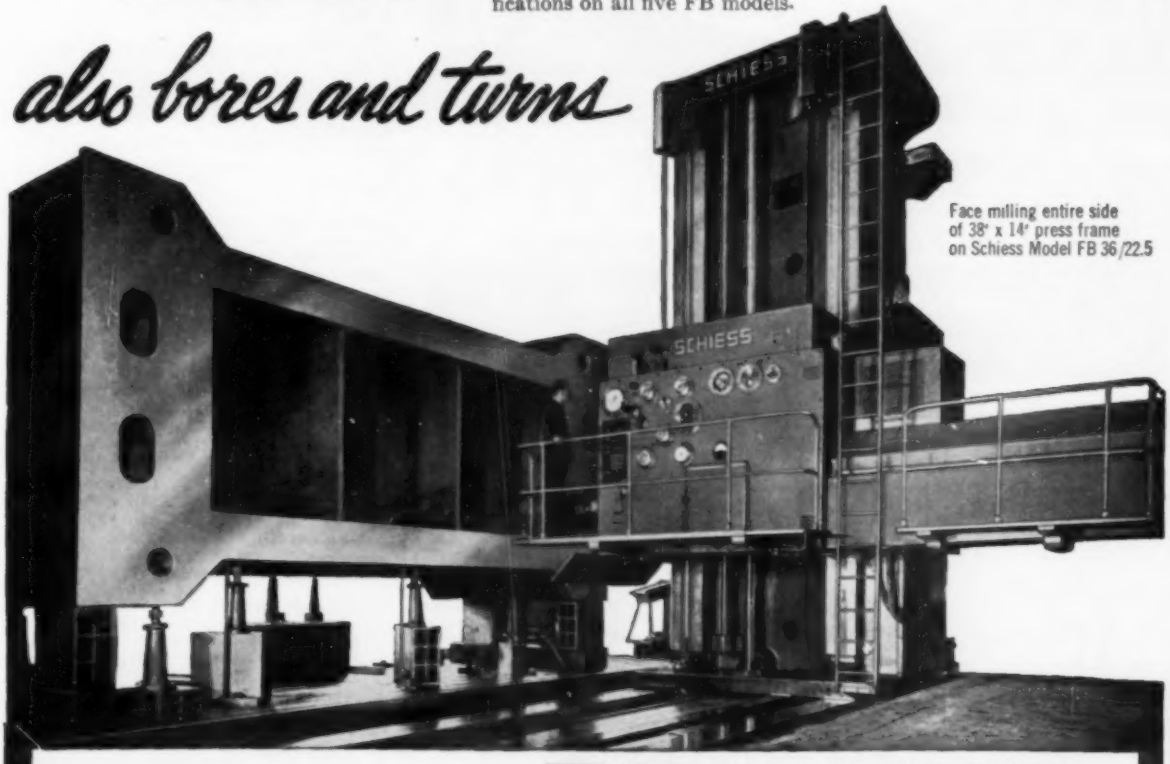

Face milling entire side of 38' x 14' press frame on Schiess Model FB 36/22.5

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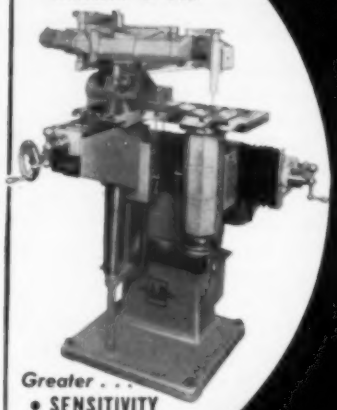

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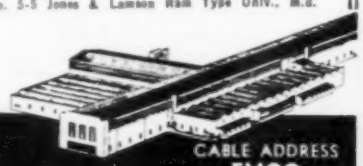

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- 160 tons, Bliss #90½-8S, Bed 60"x36", Str. 8"
- 100 tons, Niagara #80C, Bed 72"x42", Str. 8"
- 150 tons, Bliss #52-150-60-36, Str. 6", New 1954
- 140 tons, Bliss #90½J, Bed 108"x48", Str. 18"
- 140 tons, Bliss #90½H, Bed 84"x36", Str. 18"
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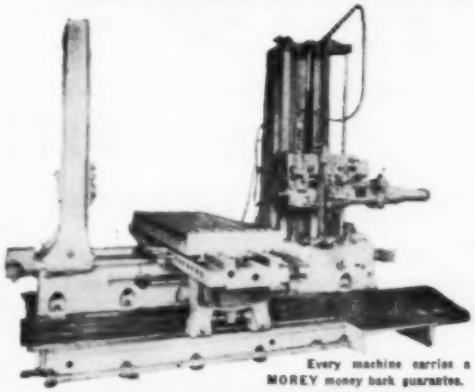

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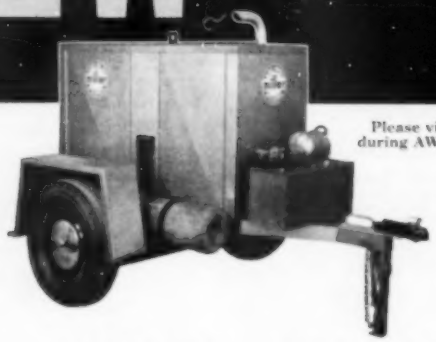

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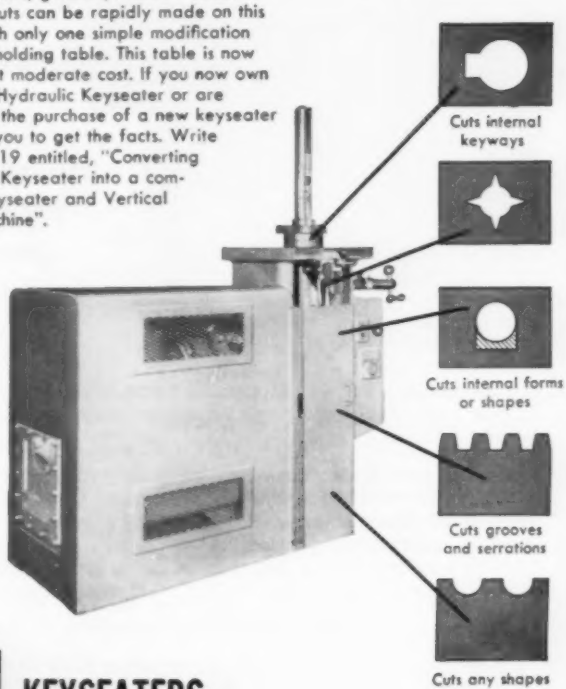

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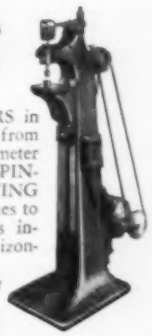

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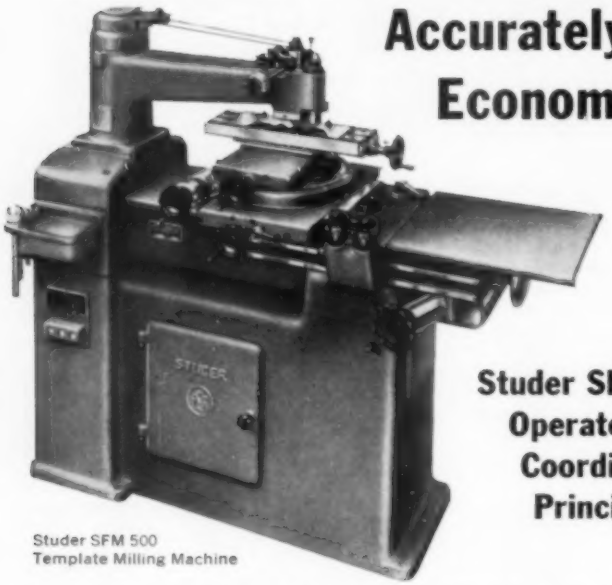

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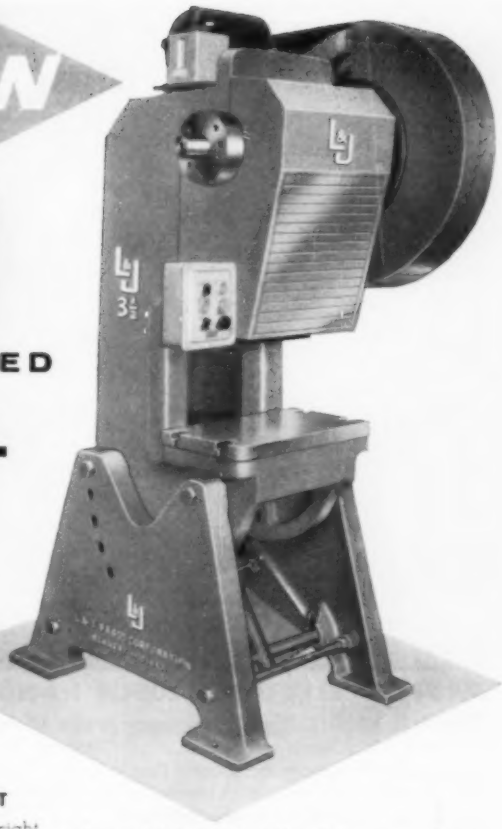

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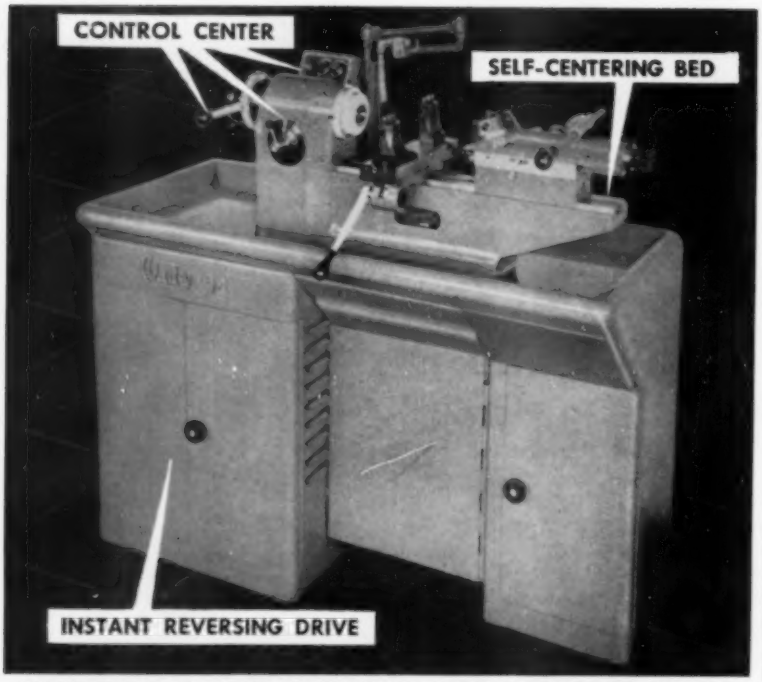

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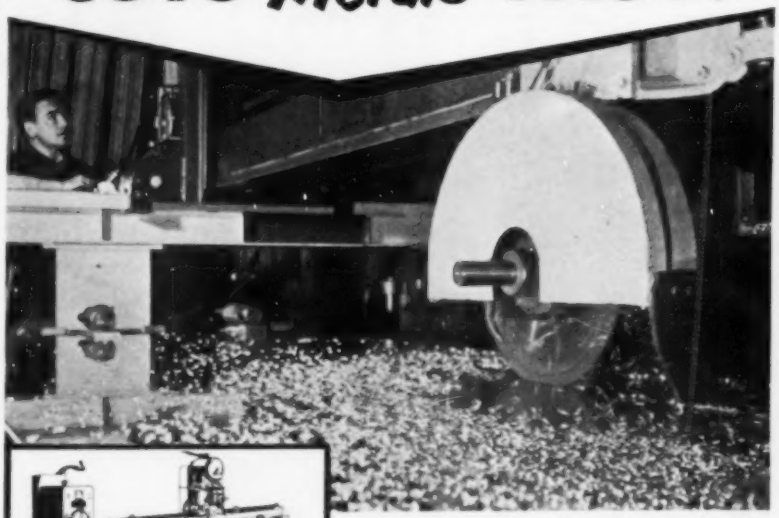

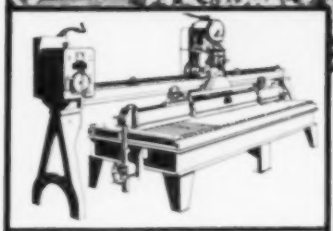

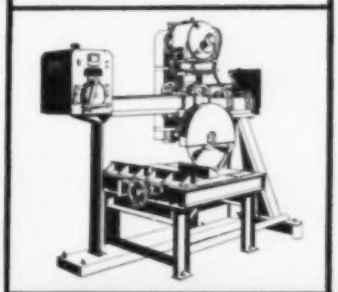

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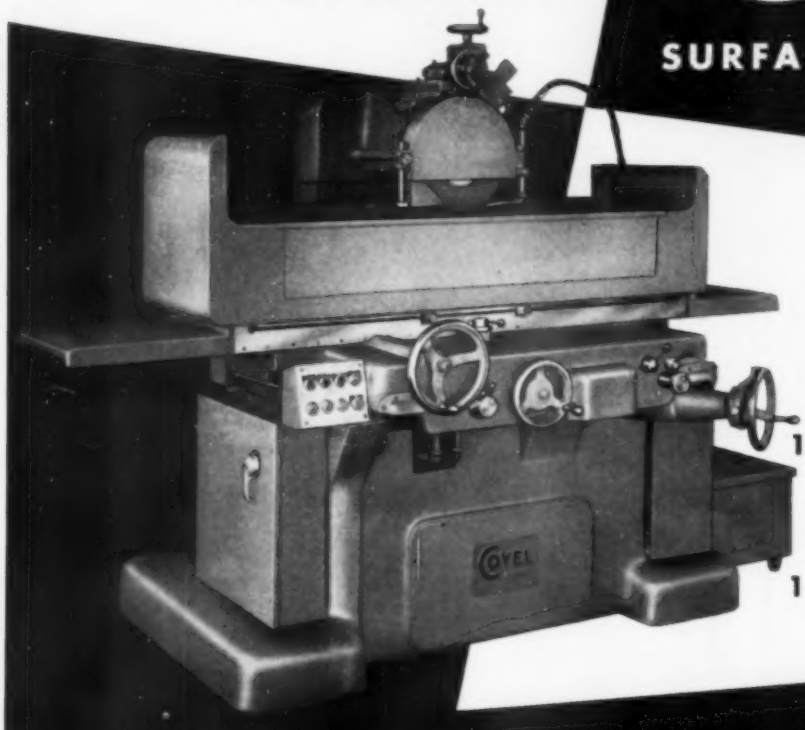

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GRINDS WORK
8" x 24" x 18" high!

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14" x 24" x 18" high!

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- Power elevation is easy on operator. (Available at extra cost.)

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Spindle Motor H.P.	2	3	5
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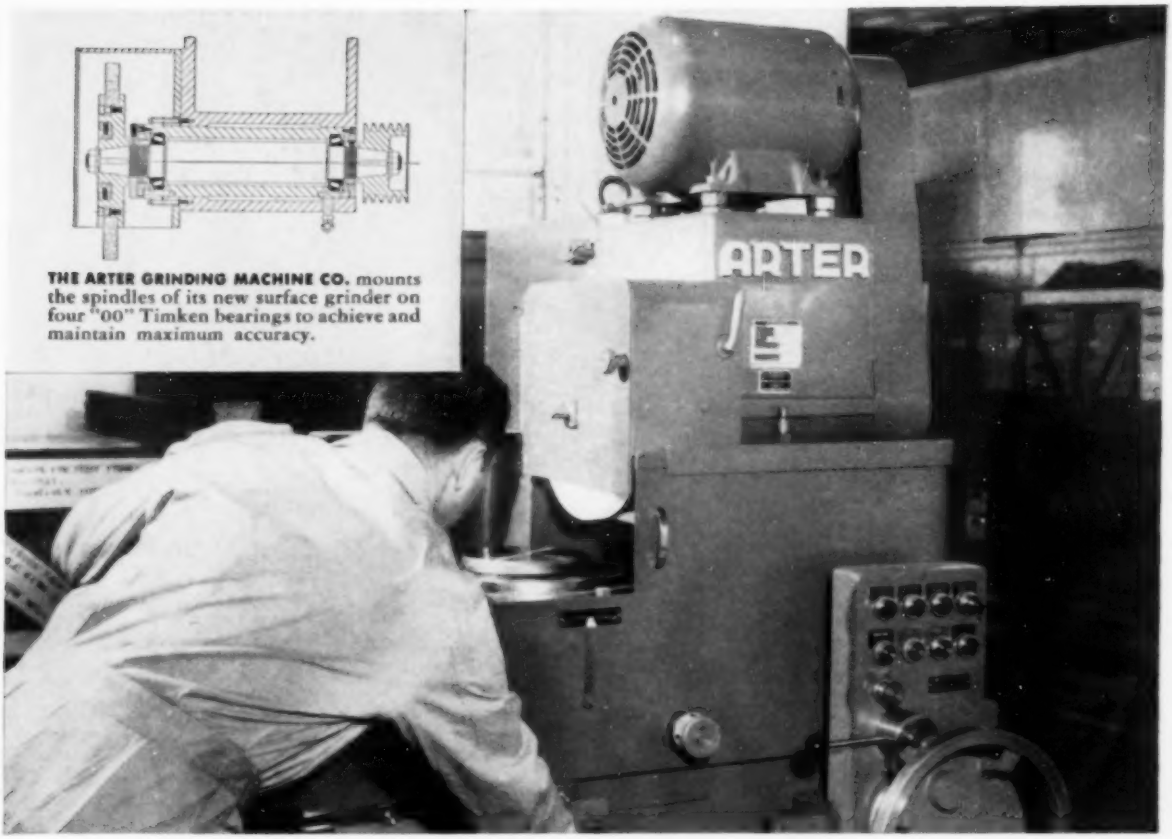

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New precision grinder costs less to make, gives smoother spindle operation with TIMKEN® bearings

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